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INSTRUMENTS and AUTOMATION

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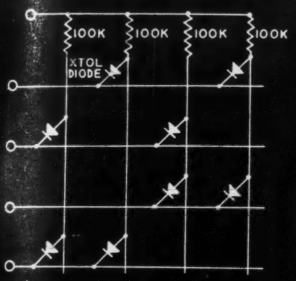
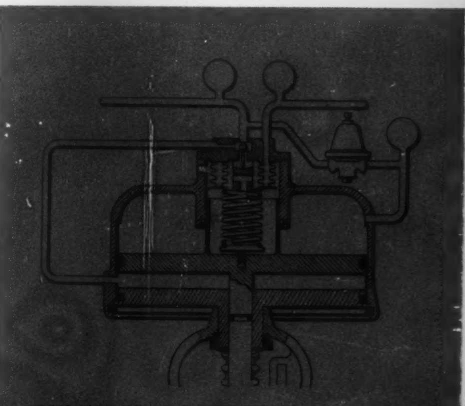


TAL PROCESS CONTROL - - - 1979



CYLINDER POSITIONERS - - - 1986

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Part 1 of two parts
OCTOBER 1956

THIRD INTERNATIONAL AUTOMATION EXPOSITION

EXHIBITORS and PRODUCTS - - - - 2027

the MIDWESTERN 560B OSCILLOGRAPH . . .

designed and tested to withstand shock accelerations in excess of 3,000 gravities . . .

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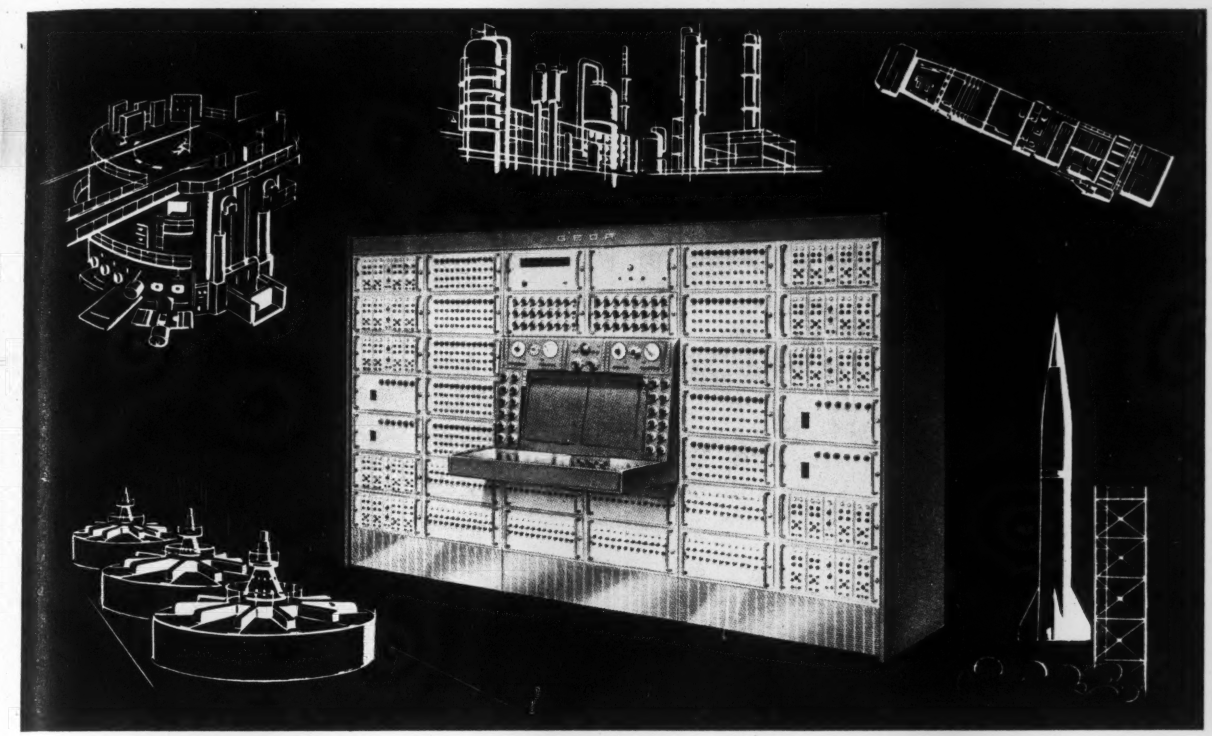

among the problems we can solve for you...

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• • •

Now available is a new Goodyear Engineering Report, GER-7648, which describes the principles of operation of the GEDA A-14 Nuclear Reactor Simulator. Write now for your copy.

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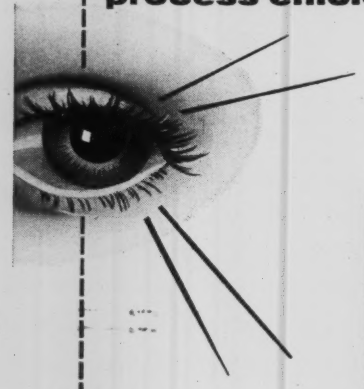

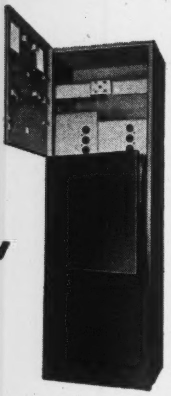

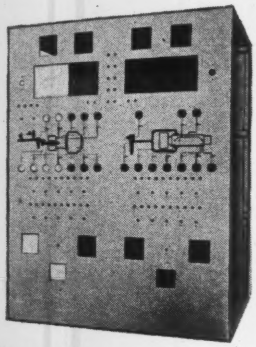

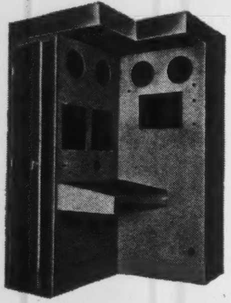

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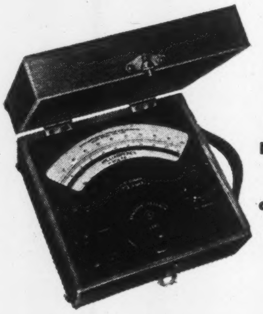

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INSTRUMENTS and AUTOMATION

Volume 29, No. 10
October 1956

Editorial

A New Concept 1965

ISA Show Highlights 1965

Some Conference and Show "Firsts" 1967

Wescon Highlights 1968

Special Feature

Third International Automation Exposition—Exhibitors and Products 2027

Feature Articles

Digital Process Control 1979
Martin Klein, Frank K. Williams and Harry C. Morgan

Electron Photography 1985

Positioners for Cylinder Actuators 1986
C. S. Beard

Electronic Circuitry 1992
Milton H. Aronson and Charles F. Kezer

Measurement of Short Time Intervals 1994
F. K. Priebe and H. D. Tanzman

Iron & Steel⇄Instrumentation 1998

Process Control and the Analog Computer 2000
Joseph L. Hussey

Journal of the Southern California Meter Association

Economic Aspects of Process Control 2006
William C. Gardner and John E. Leary

The Simulation Council Newsletter 2015

Other Regular Features

Letters to the Editor 1896
Trends 1905
Panhandle Pete 1913
News 1916
Stock Report 1930
Inquiries 1941
Events Calendar 1945
Biographies of Significance 1947
New Instruments 2046
Briefs 2106
New Literature 2116
Searchlight Section 2130
Advertisers' Index 2132
Inquiry Card 2133

THE MAGAZINE OF INSTRUMENTATION AND AUTOMATIC CONTROL FOR 28 YEARS – SINCE JANUARY 1928

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INSTRUMENTS
and
AUTOMATION

Letters to the editor

Editor, I&A:

The Valve Positioner article in the Sept. issue of I&A is a fine job that has needed doing for some time. There's just one thing: the Foxboro model you've described is our Type B which is gradually being superseded by our Type C, which was announced at last year's ISA Show.

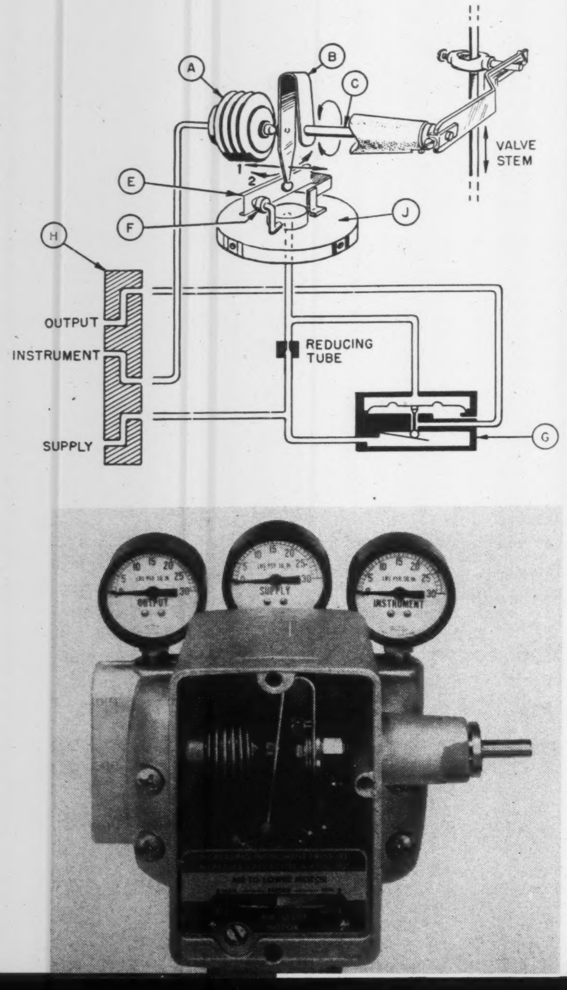
B. A. Chase
Control Valve Sales
The Foxboro Company
Foxboro, Mass.

The following description of the newer Foxboro Type "Vernier Valvactor" valve positioner should have been included in that article. "Better late than never."

Type C Vernier Valvactor

The "Type C Vernier Valvactor," like the Type B described previously, is a position-balance valve positioner, but is gradually superseding the Type B.

It has the same elements—(1) bellows that receives the instrument controller signal, (2) flapper-nozzle unit that controls a pilot relay, and (3) mechanical feedback from the valve stem that repositions the flapper to neutral position when valve stem position is as called for by the instrument signal. For yoke-mounting application, the Type C has a minimum of moving parts and can be easily adjusted to suit all valve actions by rotating a disc—no interchanging of components. Space requirement is considerably less with the new model.



The Type C Vernier Valvactor. Top, elements and operation; bottom, appearance.

Editor, I&A:

Several articles have been written on the subject of computers in your *Instruments and Automation* magazine. These articles are of great interest to us at the present time.

We are in a process of securing an analogue computer for ground testing and analysis of our automatic flight controls for jet aircraft. Your articles have aided us in establishing some criteria for evaluating the computers which we are considering purchasing. However, we would like to know if you have available, under separate cover, a complete series of articles dealing with analogue and digital computers.

J. Tragarz
Flight Test Engineer
Minneapolis-Honeywell Regulator Co.
Aeronautical Div.,
Minneapolis, Minn.

The *Computer Handbook*, First Edition, is what you are looking for—it contains a complete series of article on both analog and digital computers. The Second Edition, an expanded edition, will be ready in the near future.

Editor, I&A:

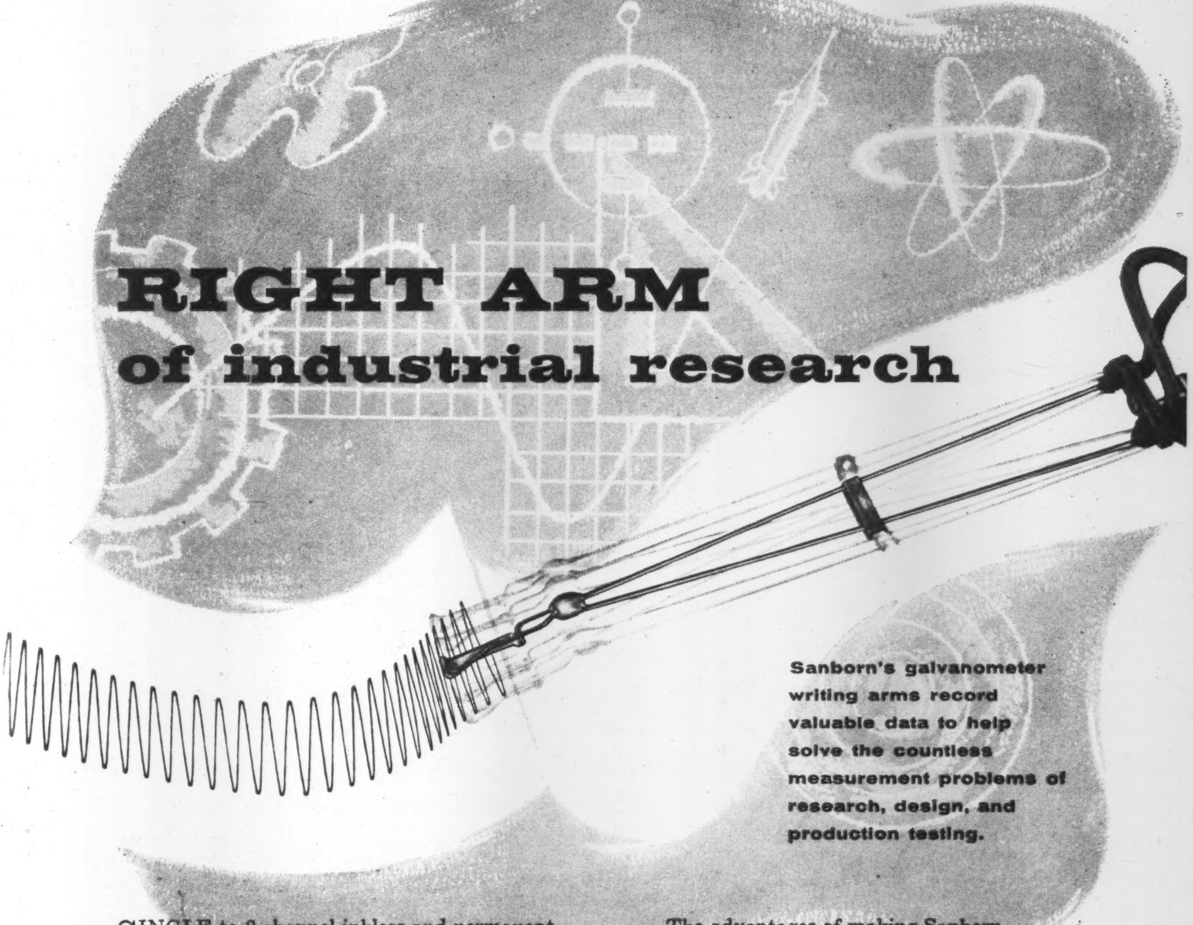
I recently received the reprints of the first eight articles on "Digital Automation" that you are forwarding to prospective subscribers. I find this reprint to be very applicable to the work now going on in the organization to which I am attached. In fact, your timing was perfect and as a result I am enclosing my order for a three years' subscription to *Instruments and Automation*.

However, there are several other people in the Air Force Armament Center that would benefit highly from this reprint and from your publication. Therefore, I am taking the liberty of enclosing a list of their names and business addresses in the hope that you will send them copies of "Digital Automation" reprints. All of these people are engineers and engineering managers directly or indirectly associated with the development of Digital Data-Handling Systems for the Air Force Armament Center's elaborate test range instrumentation system. Please feel free to use my name as the one who recommended your sending the reprints to them.

Richard E. Marsh
Fort Walton Beach
Florida

Thus does news circulate. Requests for this material now exceed the thousand mark.

RIGHT ARM of industrial research



Sanborn's galvanometer writing arms record valuable data to help solve the countless measurement problems of research, design, and production testing.

SINGLE to 8-channel inkless and permanent recording in true rectangular coordinates of 0-100 cps phenomena — ranging from telemetered aircraft data to atomic reactor characteristics — is the vital and growing role of Sanborn oscillographic recording systems in industry. The Sanborn file of users indicates that such recordings are aiding in the dynamic analysis of jet engine starters, machine tools, agricultural machinery and oil drilling equipment; performance of pilotless target aircraft, modern submarines and tracking radar systems; and the production testing of servo components, valve positioners and precision potentiometers. Sanborn systems designed especially for recording analog computer output extend applications further — in simulated flight set-ups, solution of complex problems with six or eight variables, etc.

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SANBORN COMPANY
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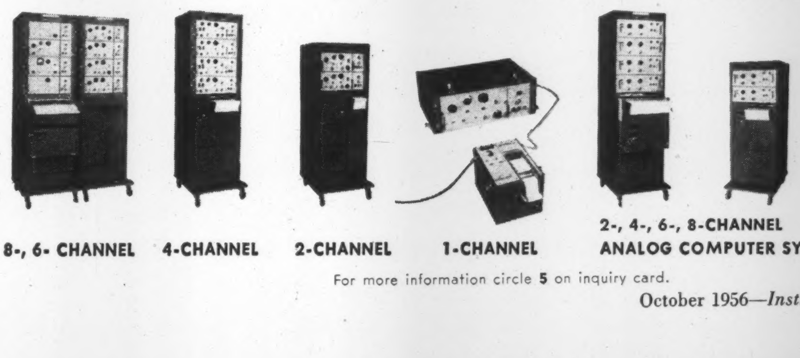

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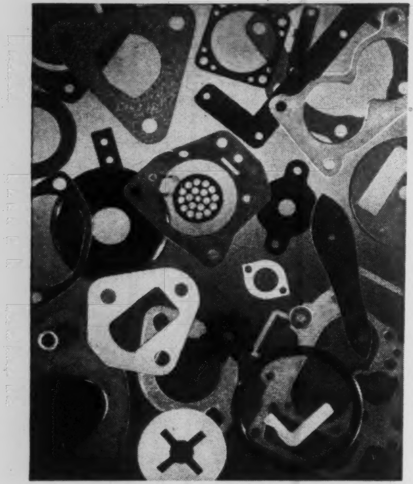

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LETTERS—CONTINUED

Editor, I&A:

On Page 1082 of Volume 29, the June issue, under "1955 Reports," it is stated "Minneapolis-Honeywell Regulator 1955 Sales—$19,000,000."

Of course anyone familiar with the amount of business done by Minneapolis-Honeywell would realize that this figure was entirely wrong for 1955 sales. The actual figure as taken from the Minneapolis-Honeywell 1955 Annual Report was $244,482,-068.

Richard P. Brown
Philadelphia 2, Pa.

Our editorial slip consisted of using the word "sales" instead of "earnings." Minneapolis-Honeywell reported $244,482,068 *sales* and $19,278,648 ($4 million over 1954) *earnings* in 1955. What's $220 million between friends?

Editor, I&A:

Your article "Practical Analog-Digital Converters" in the June 1956 issue of *I & A* was most informative but may have, unknown to the authors, created a misimpression in the minds of your readers.

A list of converters was supplied and referenced in the text as follows: "As shown in the following listing of available converters . . ." By neglecting the use of the word "some" before "available converters," it appears that the appended list is exhaustive. There are, however, other commercially available analog-to-digital converters with proven performance records that offer features of interest to potential users.

B. H. Manheimer
The Austin Co.
Special Devices Div.
New York 11, N. Y.

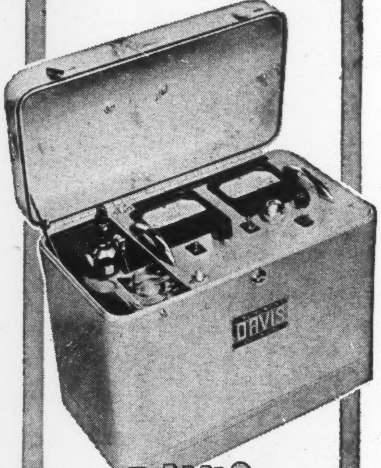
We slipped up in forgetting about the Austin Shaft Position Quantizer. The following material should have been included with the induction-type digital converters in No. 9 of the Digital Automation series:

The Austin Company

The Austin Company "Shaft Position Quantizer" provides a readout in pulse form proportional to the position of the input shaft, at any preset times (up to 60 per second) regardless of whether the input shaft is standing still or rotating.

Direct coupling to the input shaft, with no gears used, eliminates chances of mechanical errors due to backlash or other gear errors.

Measures oxygen and combustibles simultaneously!



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Weight: 40 lbs.
115V, 60 cycle operation

Send for Bulletin 11-34

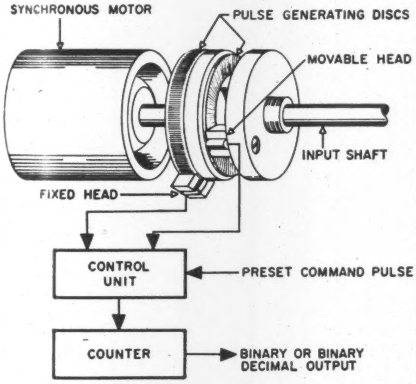
INSTRUMENT DAVIS DIVISION

DAVIS INSTRUMENTS
Division of
Davis Emergency Equipment Co., Inc.
80 Halleck Street, Newark 4, N. J.

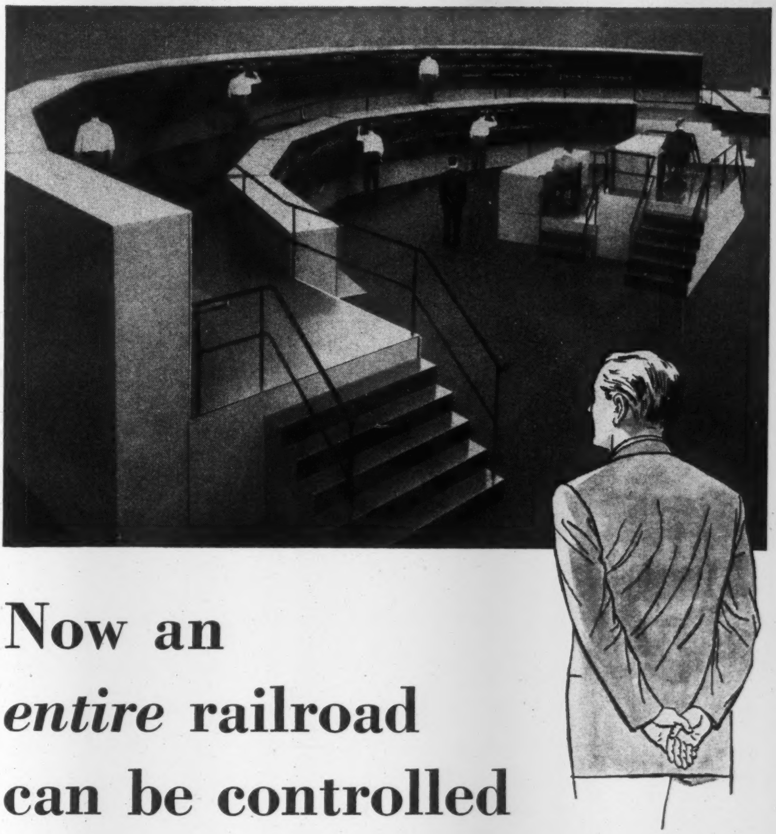
For more information circle **7** on inquiry card.

The 3600-rpm synchronous motor revolves the two engraved pulse-generating discs, rigidly coupled together, past a fixed head and a movable head (controlled by the input shaft). As the discs have 500 divisions which generate pulses by induction, 30,000-pps signals are sent to the control unit. In the control unit the frequency is multiplied eight times, creating a resolution of 1 in 4000 parts—with no gearing or changing of rotors.

When a command pulse is received, the control unit compares the positions of the two heads by generating a train of pulses directly proportional to this displacement. A count of these pulses provides an output of shaft position at the instant of command in binary, binary decimal, or other convenient form.



Exact time of readout is established in the unit to within ±2 microseconds of the time of the command pulse. Controlled readout time and accuracy of measurement of successive shaft positions allow for precise velocity and acceleration calculations. Variations include the number of counts per turn of the shaft, variations in means of readout and control, and combinations of the quantizer with other system elements such as synchros.



Now an *entire* railroad can be controlled from one central point

Traffic control engineers have long dreamed of being able to control an entire railroad from one central point. Today, the equipment has been developed at Union Switch & Signal that will do this job. Operators with modern Union Centralized Traffic Control systems, can now direct train movements by signal indications on 100, 500, 1000 or more miles of single or multiple-track railroad.

What is your control problem?

Union Switch & Signal engineers are applying experience gained from designing installations of control systems covering 25,000 miles of railway—to industrial applications. They have developed centralized control of pipelines, control of steel mill soaking pit doors from traveling cranes, control of TV tower elevators without wired connections between cab and motor controller. Other systems and devices such as flight simulators, and guided missile ground handling equipment are part of their daily work. These men can help you in various phases of industrial automation. Write us about your problems.

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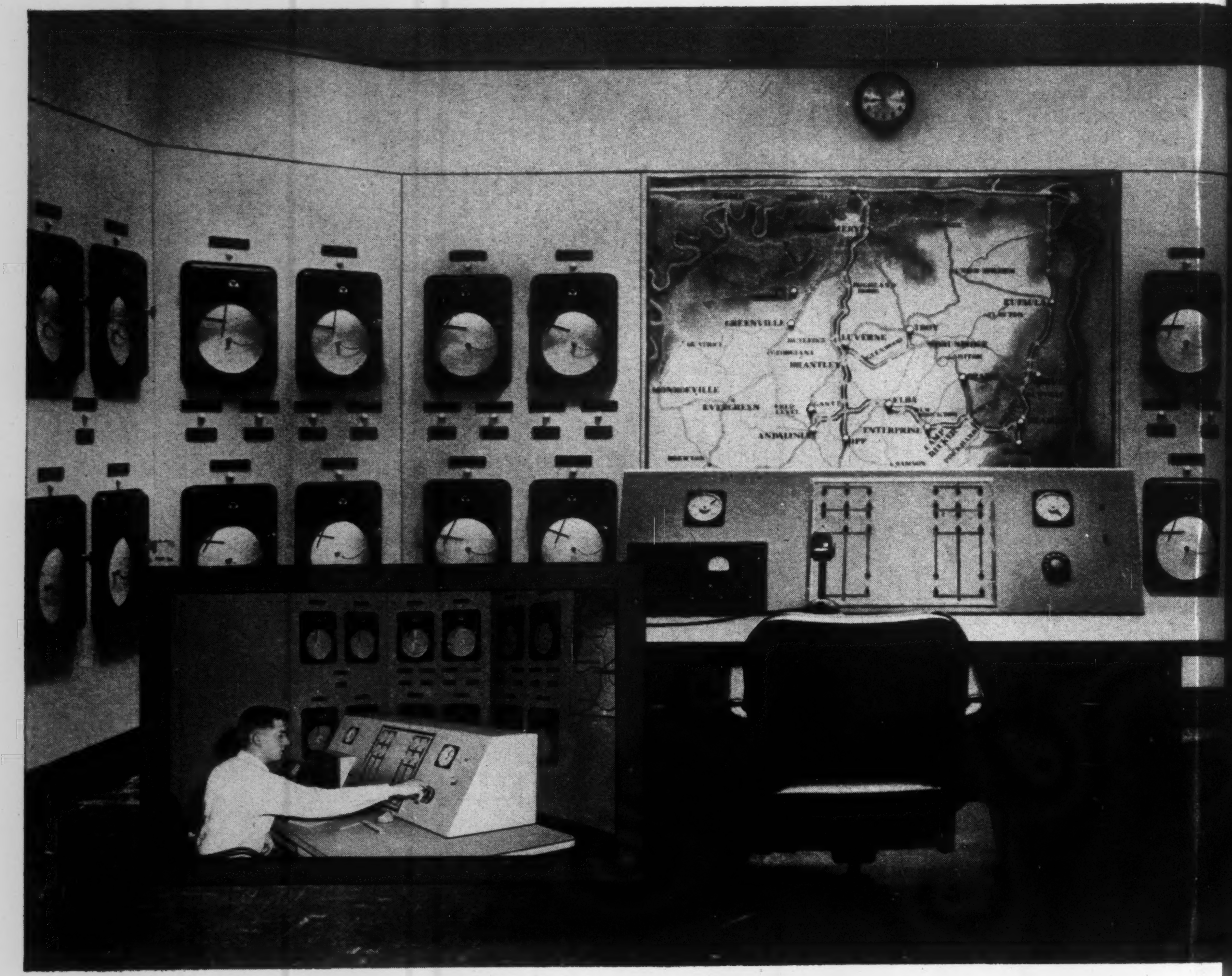
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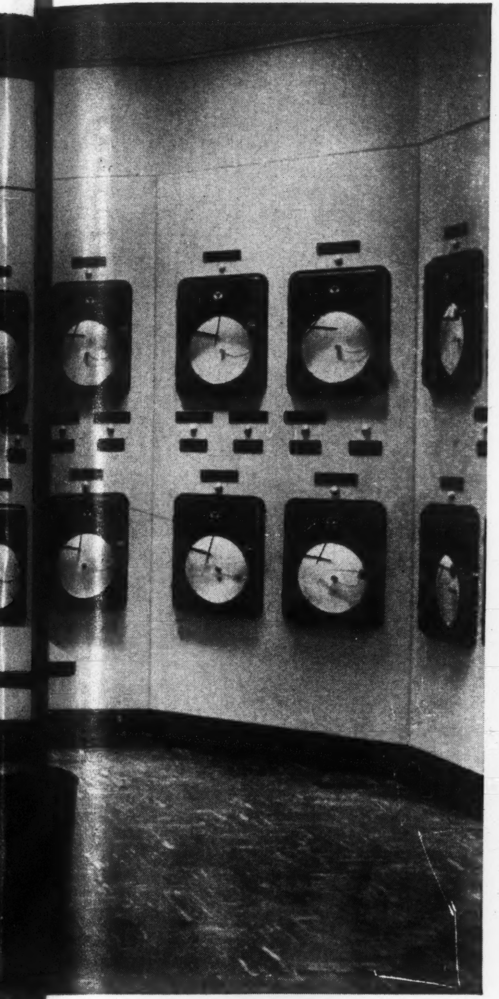
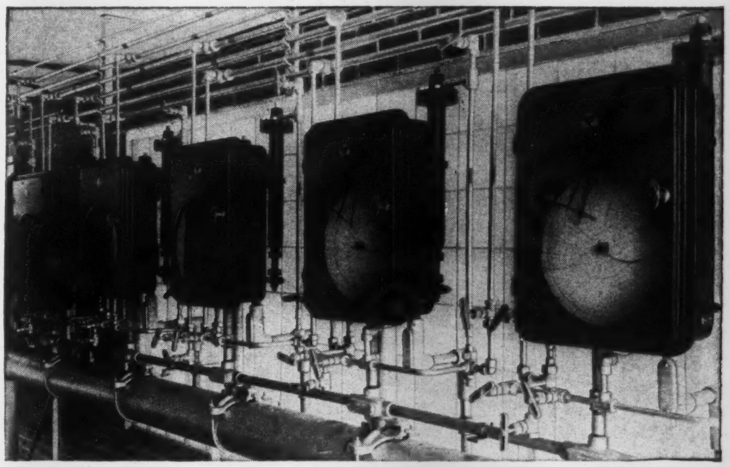
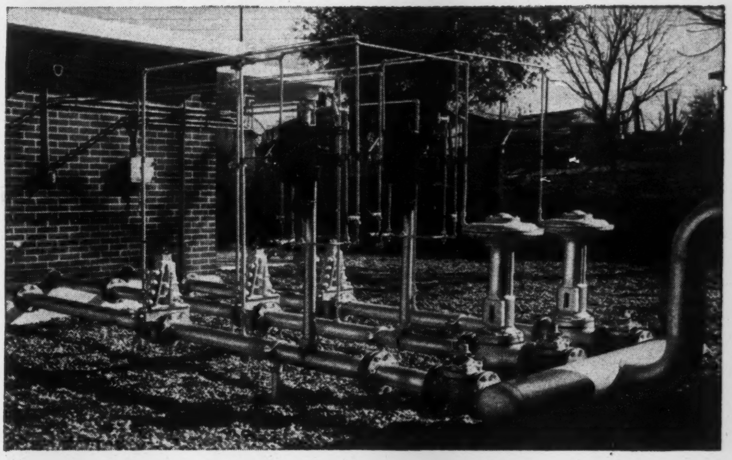
For more information circle 9 on inquiry card.



DISPATCHER STATION – By dialing a single circuit, dispatcher obtains total flow in cubic feet and pressure from each of the 14 city gate stations, plus total flow in cubic feet, pressures and differentials of orifice meters and controllers at each intake station to permit complete remote dispatching.



INTAKE STATIONS – All measurement at intake stations, 90 miles and 120 miles from dispatcher's desk, is combined in a totalizing relay which in turn is put on a memory relay to supply total flow since last dialing.



CITY GATE STATIONS – Each station has American automatic measurement, pressure and regulation equipment, totalizing relays and memory relays, enabling dispatcher to obtain flow for any period and obtain pressures. Complete remote control of dual flow differentials, dual first and second stage regulators.

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mr/h
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- **Operates on a single flashlight cell**
- **Weighs only 2 pounds**
- **Beta or gamma by twist of a knob**
- **Two ranges: 0-25 mr/hr, 0-1 r/hr**
- **Accessories to multiply or divide both ranges by 10**

Curtiss-Wright

RADIAMETER

The Curtiss-Wright Radiameter is a radiation survey meter designed especially for health physics and industrial hygiene applications. Using a unique inverted triode circuit, it performs functions usually requiring two instruments. The lower scale provides high sensitivity for decontamination monitoring. The high scale measures stronger radiation fields usually requiring an ionization chamber type instrument.

Where other radiation survey meters require several expensive and hard-to-find batteries, the Radiameter is powered by a single inexpensive flashlight cell. It is easy to handle and slips readily into a suit coat pocket.

Having the appearance of a light meter or camera, it attracts minimum attention from plant personnel during safety checks. The one-piece cast aluminum case is light in weight, but extremely rugged and waterproof. The Geiger tube or battery may be changed in seconds and without tools. Controls are simple, even for non-technical personnel, and the meter is easy to read.

Accuracy is ±10% of full scale on both scales for energies from 50 to 1,200 kev. The Radiameter is useful for monitoring energies as low as 15 kev. In the presence of radiation of high intensity, the instrument does not overload but continues to read off-scale. It can be zeroed even in a strong field. Its fast response permits monitoring x-ray installations turned on only momentarily. Battery life is long—approximately 140 hours.

Available accessories include a probe to multiply sensitivity by 10, a tube to divide sensitivity by 10, an alpha tube, a radium calibration source, a push-button on-off switch, and an attractive leather carrying case. Write for details.

Component and Instrument Sales Department

ELECTRONICS DIVISION
CURTISS-WRIGHT
CORPORATION • CARLSTADT, N. J.

For more information circle **10** on inquiry card.

Editor, I&A:

We have heard so many nice things about you from your space representatives—extolling the extent of your intelligence, praising your unflagging enthusiasm for furthering the cause of science, and expressing their pride in your greatness of heart for encouraging small but sincere endeavors for improving the industry—that we are emboldened to submit for your perusal our own timid effort to produce a periodic publication.

Although we assure you that you need not fear competition from our paper, perhaps it might be well if you knew of its existence, and, in view of the sweetness of soul which your representative assures us you have, we feel that we can rely on you for guidance and encouragement.

Hoping to receive your charitable opinion of this little effort, we remain

Anthony A. Blundi,
Publisher of THE WORD
Burroughs Corporation
Philadelphia 7, *Pa.*

We consider this literary effort—*The Word*—of more than passing importance. It has already become a "dapifer" enlightening us about "burking," and we predict success for this little journal of dual function—enlarging the vocabulary of engineers while mentioning Burroughs Pulse Equipment, in passing as it were.

Editor, I&A:

I have read with interest the article on Dr. Axel H. Peterson in the March issue of *Instruments and Automation.* My interest was immediately drawn to the paragraph on "Instrument Rental Service."

There is one aspect which I do not quite understand, and that is what is meant by "Fellowships."

Leo Scharry
Professional Engineer
Alta Instrumentation
& Metering Co.
Montreal 12, *Quebec*

Doctor Peterson replies as follows:

Mr. Aronson has referred your letter to me for an answer. Our definition of a fellowship is as follows:

A fellowship for research in pure or applied science, according to the Institute's investigational system, represents the bestowal, on a scientist or upon a group of scientists, of a grant for research, of the rights and privileges of Institute membership, of the advice of the organization's executive staff, of the cooperation of other members, and of the use of the Institute's facilities.

Mellon Institute operates by means of contracts with Fellowship Donors for specified periods of time, which are required to be of at least one year's duration, with the full-time services of at least one scientist on each Fellowship. Only problems of fundamental importance or of real significance to science and industry are accepted for study.

Thus a manufacturer, seeking to investigate a major problem or hoping for general benefit from a planned scientific research program, may execute a contract with the Institute, provided that the proposed field of investigation is one in which the application of the natural sciences—particularly the chemical sciences—offers hope of success, and also provided the field is one not already under investigation in the Institute. Here only one research project or Fellowship in any given field is operated at a time; hence there is no conflict between Donor interests with the Institute, and cooperative association among the individual research specialists is encouraged at all times. All results of the research of a Fellowship are the property of its Donor.

Axel H. Peterson, Head
Department of Instrumentation
Mellon Institute of Industrial Research
University of Pittsburgh
Pittsburgh 13, *Pa.*

Editor, I&A:

The Los Angeles County Board of Supervisors is looking for new methods of tallying votes . . . including consideration of the use of electronic or electro-mechanical devices to tally votes. We are inviting competent manufacturers to submit bids on the development of prototype equipment.

Arthur J. Will
Chief Administrative Officer
County of Los Angeles
Board of Supervisors
501 *Hall of Records*
Los Angeles 12, *California*

Editor, I&A:

We have had wonderful response to your insertions covering our products; in fact, your magazine has given us the top quota on sales leads.

Iris Becker
Sales Promotion
J. B. Rea Company, Inc.
Santa Monica, Calif.

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From quality cast case gauges to standard steel case gauges, United States Gauge is your prime source for any type gauge, for any application. The industry's most complete line—more than 50,000 different standard gauges—is available for such applications as panel boards, compressors, pumps and process control. With slight modification, many of these standard gauges will meet special design requirements.

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AN ACCURATE, PORTABLE, MULTI-FUNCTION INSTRUMENT

THE LEWIS *PORTABLE* TEST POTENTIOMETER

for Service Testing Exhaust Temperature Measuring Systems

Developed for use by field service engineers of a leading engine manufacturer, the Model 13P05 Test Potentiometer has proven its serviceability in desert heat and arctic cold at maintenance bases on many points of the globe.

FOUR PRECISION INSTRUMENTS IN ONE!

Model 13P05

For dependable maintenance, use test equipment made by the manufacturer of the components to be checked.

A PYROMETER-POTENTIOMETER

for measuring exhaust thermocouple temperatures that is truly portable with a sturdy pivoted galvanometer and without a standard cell. Accurate automatic electrically operated cold junction compensation permits this instrument to be used in ambient temperatures from below freezing to plus 120°F. Mirror scales with precise hand-drawn graduations and knife edge pointers insure accurate readings from zero to 1000 degrees Centigrade.

A LOW RANGE OHM-METER

with a widely spaced, hand drawn scale for checking the resistance of leads, thermocouples and balancing resistors to insure correct adjustment to match external resistance requirements of exhaust temperature indicators, either eight or twenty-two ohms.

A KILO-OHM METER,

energized by a 67½ volt battery for checking insulation resistance of lead-wires and thermocouples. Due to the potential applied, this circuit is more effective in detecting flaws than conventional ohm meters. A hand-drawn scale is clearly marked in kilo ohms resistance.

A THERMOMETER TESTER

for precise scale error checks of exhaust temperature indicators having either eight or twenty-two ohms external resistance. A controlled power supply energizes the indicator under test, through the correct series resistance, and the zero to 1000°C temperature scale is used as a reference standard. Recommended for use in adjusting exhaust indicators in accordance with ambient temperature, with power applied for 700°C, through the proper resistance. A liquid-in-glass thermometer and flexible test leads are supplied with each instrument.

LEWIS ENGINEERING CO.
NAUGATUCK, CONNECTICUT

For more information circle 12 on inquiry card.

INSTRUMENTS and AUTOMATION Trends

Industrial research is one of the fastest growing industries of today. Whereas economy is growing at rate of about 3% per year, industrial research has tripled in size every ten years since 1930—from about $300 million in 1930 to about $1 billion in 1940 to about $3 billion in 1950, and is expected to exceed $5 billion in 1956, reaching nearly 1% of the total gross national product. The industry now employs about 500,000 persons. Significance is that research leads to new products, new industries, and is founded on a base of instrumentation. Trend is to integrated team-work research activities with ever-growing emphasis on instrumentation.

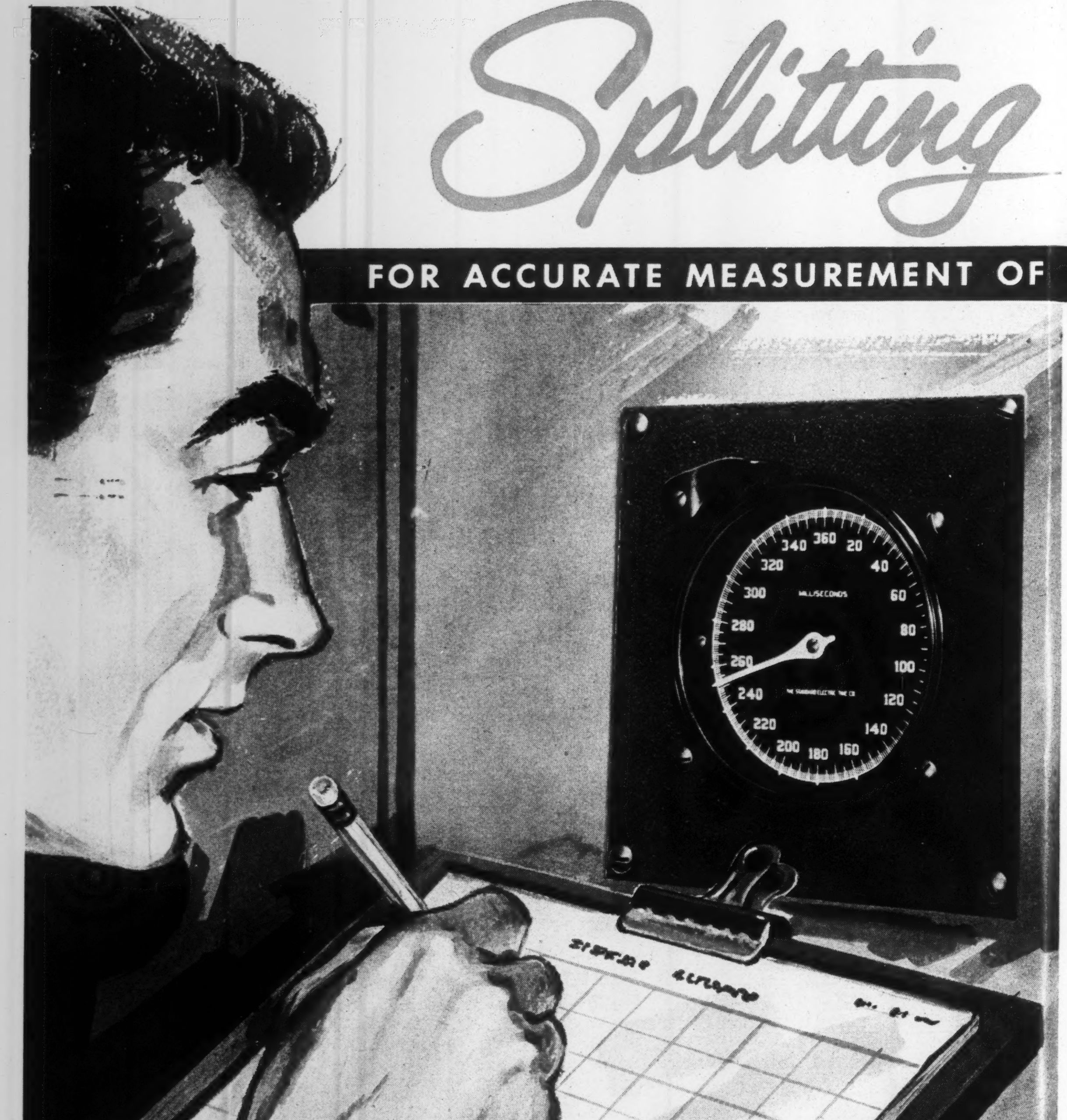
Comparison of 1955 and 1945 National Income by major industrial divisions, (billions of dollars) shows strength of manufacturing, trade, and services; weakness of agriculture. Note large percentage decline in government income.
(Source: Office of Business Economics, U. S. Department of Commerce, July 16, 1956.)

	1955		1945	
	Amount	Percent	Amount	Percent
All industries, total	324.0	100.0	181.2	100.0
Manufacturing	101.8	31.5	52.0	28.7
Wholesale and retail trade	55.0	17.0	28.0	15.4
Government and government enterprises	37.7	11.6	36.8	20.3
Services	32.5	10.0	14.6	8.1
Finance, insurance and and real estate	29.5	9.1	12.8	7.1
Contract construction	16.6	5.1	4.3	2.4
Agriculture, forestry and fisheries	16.0	4.9	14.9	8.2
Transportation	15.9	4.9	10.5	5.8
Communications and public utilities	11.5	3.6	4.2	2.3
Mining	5.6	1.7	2.7	1.5
Others	2.0	0.6	0.4	0.2

Research and development costs revealed by informal survey by Westinghouse of several atomic-power research and development labs shows that about 37% are on metallurgical problems, 28% on mechanical engineering problems, 11% on electrical and electronic engineering, 7% on chemistry and chemical engineering, 6% on operation and test. All involve extensive instrumentation.

Types of engineers employed in these labs are 25% mechanical, 22% electrical, 15% physicists, 14% chem and chem engineering, 10% metallurgy, 4% mathematics. Only 10% had doctor degrees. Surprising result: only handful of men considered themselves nuclear engineers.
Only about 500 engineers have received formal nuclear training to date; about 5000 have been trained "on the job." Four times as many could be used.

Outstanding developments in the field of general aviation (all types) in past 10 years, reports CAA, is shift from instructional and pleasure flying to commercial airline and business and industrial transportation. Total hours flown in 1954 in general aviation was 8.8 million hours, and is predicted to reach 14 million hours by 1965. Business flying is expected to increase from 4 million hours in 1954 to 7.5 million in 1965.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Springfield 2,
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SINCE 1884

THE STANDARD PRECISION TIMER

is the indispensable STOP Watch in laboratory and test cell, on experimental nuclear projects, precision production, check and final inspection. Many important applications in almost every industrial plant and research laboratory.

For more information circle **13** on inquiry card.

Split Seconds

ELAPSED TIME . . . AS CLOSE AS 0.001 OF A SECOND

PRACTICALLY ALL Representative Manufacturing, Processing and Research Plants
USE STANDARD PRECISION TIMERS

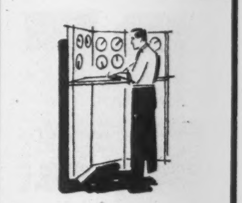
At one of the world's largest automotive manufacturers — timing test action in automatic transmission research.

It is our frank belief that literally hundreds of concerns have not yet scratched the surface of usefulness to which Standard Precision Timers can be put to work in their plants.

For Glenn L. Martin Co.'s Gunnery Trainer — in 12-channel Playback System designed by Cook Research Laboratories.

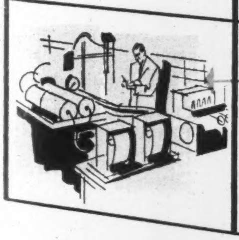
At Eastman Kodak Co. — timing photo cell controlled exposures in automatic photo printing machine.

At Yucca Pass, Nevada Proving Grounds — helping maintain split-second control of atomic bomb tests.

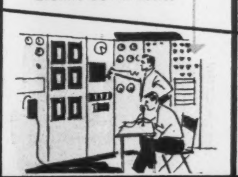


At General Electric Co. — Trumbull Division — measuring operating time of circuit breakers.

In Bell Telephone offices throughout the U. S. — timing elements required to complete telephone connections.



At Bendix — Westinghouse Research Dept. laboratories — measuring brake application and release time to 1/100th of a second.



At American Brass Co. — indicating metallurgical analysis in Direct Reading Spectroscope developed by Baird Associates.

World's most accurate and rugged time measuring instrument. Built in many different and advanced designs to meet practically every need of precision time measurement. Requires minimum maintenance.

Synchronous motor drive. Electric clutch controlled by manual switch, automatic switch or output of electronic tubes. Manual or electric zero reset.

Model	Scale Divisions	Totalizes	Accuracy
S-100	1/5 sec.	6000 sec.	±.1 sec.
S-60	1/5 sec.	60 min.	±.1 sec.
SM-60	1/100 min.	60 min.	±.002 min.
S-10	1/10 sec.	1000 sec.	±.02 sec.
S-6	1/1000 min.	10 min.	±.0002 min.
S-1	1/100 sec.	60 sec.	±.01 sec.
MST	1/1000 sec.	.360 sec.	±.001 sec.
MST-500	1/1000 sec.	30 sec.	±.002 sec.

SEND TODAY for Bulletin #198 describing entire line with partial list of thousands of customers, and summary of some of the most frequent (and some of the most unusual) ways they use STANDARD ELECTRIC TIMERS.

The STANDARD ELECTRIC TIME Co.
93 Logan St., Springfield 2, Mass.

Please send Bulletin 198 describing your line of instruments for measuring elapsed time as close as 0.001 seconds.

Name.................. *Title*..............

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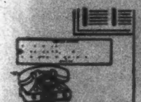
We suggest you check your requirements for Standard Timers and other products today. Your order or inquiry will receive prompt attention.



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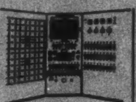
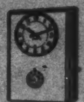


ANALOGUE COMPUTERS



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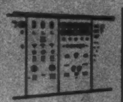

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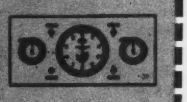

PRECISION TIMERS and TACHOMETERS

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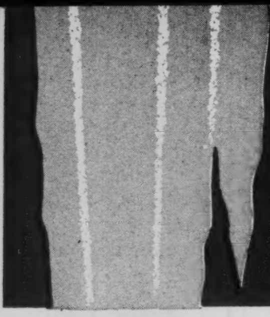

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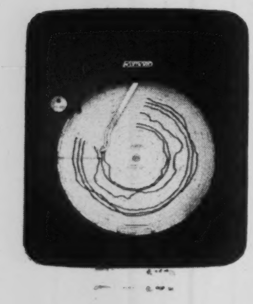
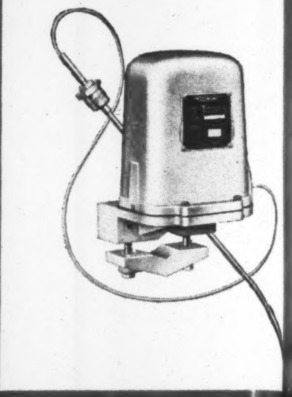


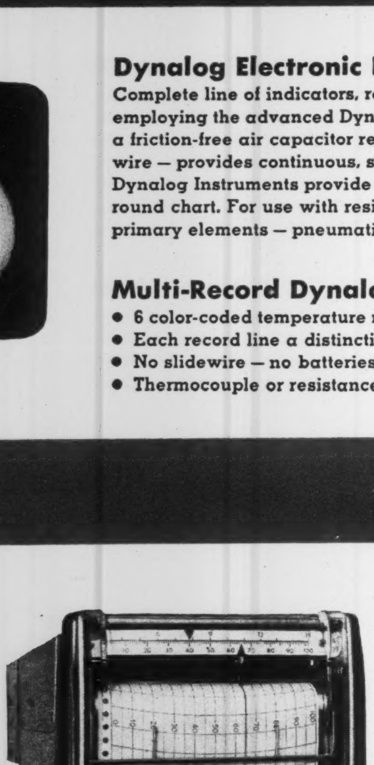
Dynalog Electronic Instruments

Complete line of indicators, recorders, and controllers employing the advanced Dynalog measuring system in which a friction-free air capacitor replaces conventionial slidewire — provides continuous, stepless balancing action. Dynalog Instruments provide up to six records on a single round chart. For use with resistance or voltage type primary elements — pneumatic or electric control action.

Multi-Record Dynalog

- 6 color-coded temperature records on one round chart.
- Each record line a distinctive, non-smudging color.
- No slidewire — no batteries — no standardizing.
- Thermocouple or resistance bulb types.





Consotrol* Recording Control Station

One of the complete Consotrol line of compact panel indicato recorders, and controllers. This advanced control station features full 4 chart and scales, six-months' ink supply, bumpless auto.-man. transfer The M/58 Consotrol Controller, shown here integrally mounted, provide

- All four control actions, with two reset ranges, easily adjustable to widest variations in operating conditions.
- Easy lever-setting proportional band, calibrated to 500%.
- High sensitivity and precision due to unique "floating disc" balancing action — even a widest settings of proportional band.
- Interchangeable "plug-in" components.
- Continuously variable reset resistance gives 500:1 rangeability.

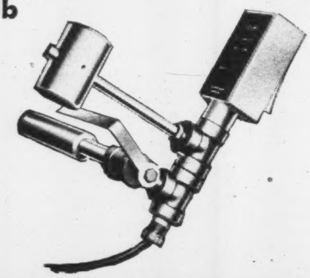
PRIMARY ELEMENTS

A complete selection of primary elements for filled thermal systems, resistance bulbs, and thermocouples. Besides standard and thermocouple types, special elements and accessories are available to meet the requirements of virtually any industrial application.

Dynatherm Resistance Bulb

For use with Dynalog Electronic Instruments.

- Superior measurement performance for temperature up to 600°F.
- Fastest response due to positive metal-to-metal end contact with standard wells or sockets.
- Highest sustained accuracy. Permits use of extra-narrow scales — ideal for precise temperature difference measurements.



Roll Surface Temperature Element

- Continuous, automatic measurement or control of roll surface temperature up to 450°F.
- Extra-rugged construction — with "feather" touch. Won't mark or score the roll.
- Eliminates friction, radiation, and convection errors.
- Simplest, most accurate way to measure roll surface temperatures.

PROBLEM

from – 450°F to + 2800°F

Instrumentation

Model 12A Temperature Pneumatic Transmitter

- Simple way to measure remote temperatures in the —100°F to +1000°F range. Operating spans of 50°, 100°, 200°, and 400°F.
- Compensated for ambient temperatures and pressures.
- Compact, easily installed. Uses regular ¼" O.D. tubing transmission lines — no troublesome conduits, no costly capillary tubing.
- Suitable for any hazardous, corrosive, or outdoor location.

Electric Proportional Action Controller

- Can be used with any Foxboro measuring system — mechanical or electrical.
- Precise, frictionless control action through electronic relay and electric valve operator.
- 3 types of proportional control action available.
- Setting knob permits easy, stepless adjustment of control band throughout range of instrument.

Whenever you have a temperature problem in the —450°F to +2800°F range, you can depend on Foxboro Instrumentation for the best solution. Foxboro's outstanding combination of truly advanced instruments and unequaled experience in applying them, has successfully solved temperature problems as widely different as helium liquefaction and jet engine testing. Foxboro offers a wide variety of primary elements, transmission devices, indicators, recorders, and controllers. Whether a single instrument or a combination is required — filled-system, electronic, or electric — you can be sure of fitting the process *exactly*. Unique Foxboro developments, such as Dynalog* Electronic Instruments, Dynatherm** Resistance Bulbs, and the 12A Temperature Transmitter, continually maintain control standards in step with every advance of modern processing. A few of the instruments which typify Foxboro's better-engineering are shown on these pages. Chart below shows complete temperature ranges covered by Foxboro measuring systems. Write for complete details. The Foxboro Company, 4610 Norfolk St., Foxboro, Mass.

FACTORIES IN THE UNITED STATES,
CANADA, AND ENGLAND

FOXBORO
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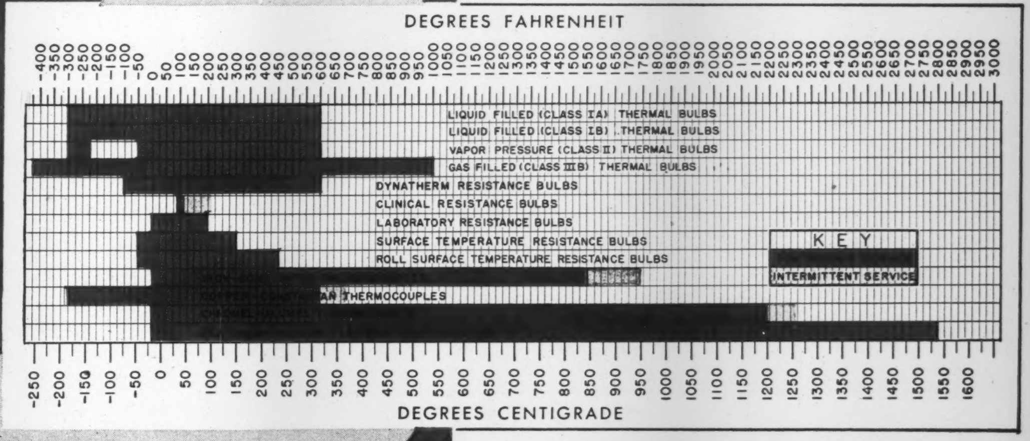
TEMPERATURE
measurement
and control

Locate your problem temperature in this table



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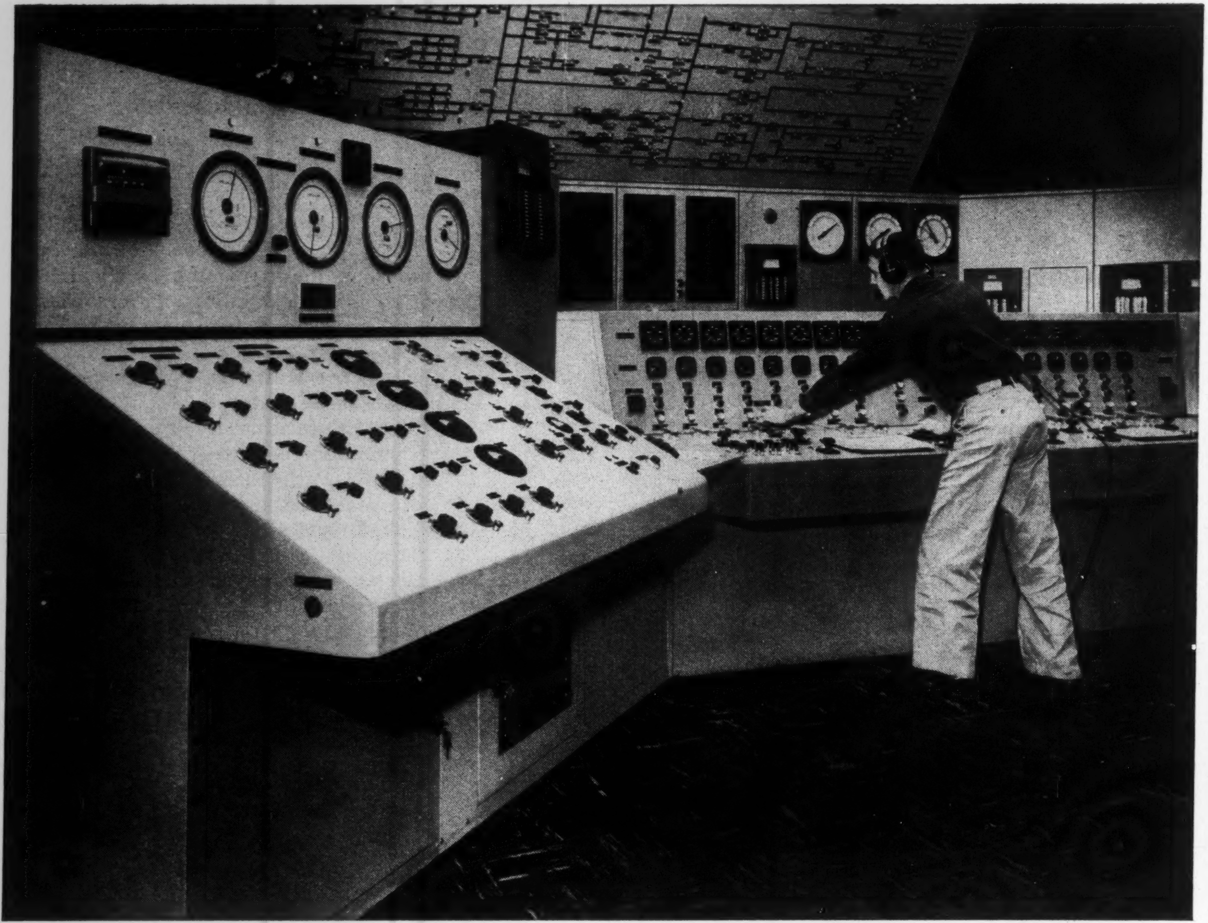


Hagan tames the whirlwind

Hagan automatic altitude control tames a veritable whirlwind at the Arnold Engineering Development Center's Engine Test Facility. The giant Tullahoma, Tennessee testing center, one of the key installations of the U. S. Air Force's Research and Development Command, uses Hagan systems to accurately simulate flight conditions up to 80,000 feet within engine test cells.

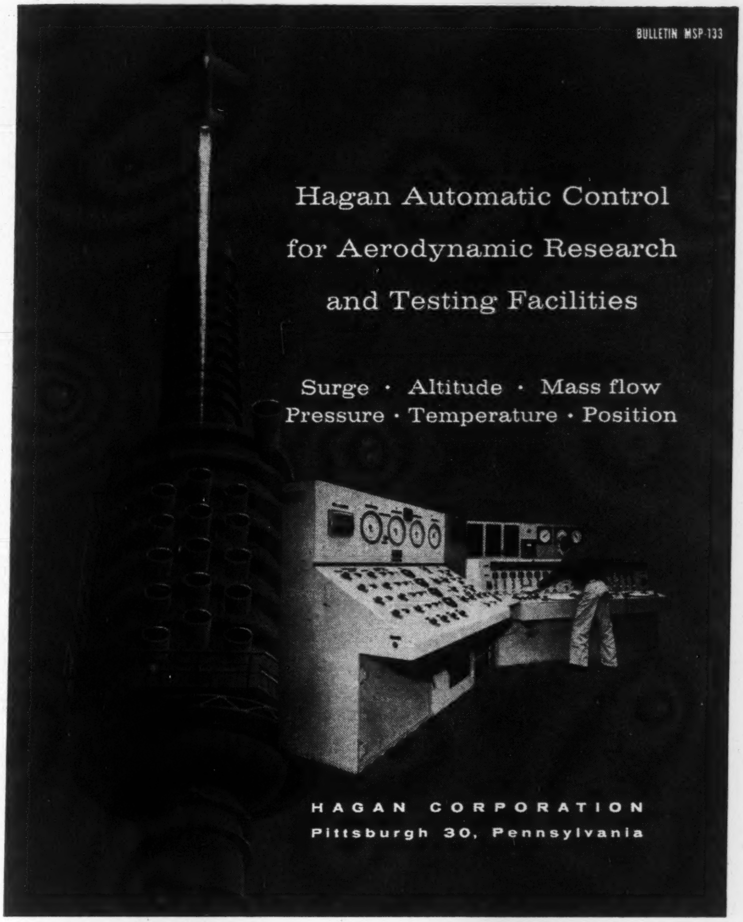
The altitude control is only one of seven major types of Hagan automatic systems, many of which will be used on all three of the A.E.D.C. facilities. The Hagan high performance devices used in these systems are available as separate components or may be integrated into automatic controls for such services as:

Surge Control • Altitude Control • Density Control • Pressure Control • Electro-Hydraulic Valve Positioning • Electro-Pneumatic Valve Positioning • Safety Interlock Systems

Hagan Corporation has been producing control systems for aerodynamic test facilities since 1939. Hagan control and instrumentation systems and components are in service at many of the major test facilities in this country. The development of high speed, high precision devices and electro-hydraulic pilot valves capable of controlling up to 300 fluid hp. have been pioneered by Hagan.

Hagan is prepared to furnish control system components for aerodynamic testing facilities or other process control functions.

For more information circle **15** on inquiry card.



BULLETIN MSP-133

Hagan Automatic Control
for Aerodynamic Research
and Testing Facilities

Surge · Altitude · Mass flow
Pressure · Temperature · Position

HAGAN CORPORATION
Pittsburgh 30, Pennsylvania

NOW AVAILABLE!

NEW CATALOG LISTS HAGAN HIGH SPEED, HIGH POWER COMPONENTS FOR AERODYNAMIC TEST FACILITIES

These Hagan devices provide the research engineer with new tools to facilitate test procedures. Hagan PowrAmp components are extremely accurate and dependable, and include transducers, controllers, computers, amplifiers and high capacity pilot valves. These components are suitable for the instrumentation and control of such factors as:

Surge • Altitude • Mass Flow
Pressure • Temperature • Position

at A. E. D. C.

Bulletin describes General Characteristics of Hagan PowrAmp Components

Hagan Bulletin MSP-133 contains specifications, applications, accuracy classifications, frequencies, and inputs and outputs of twenty-two different units. The units described include transducers, amplifiers, converters, controllers and a variety of other devices such as signal shapers, signal generators, power supplies, control stations and others.

Copies of this catalog available on request—ask for Bulletin MSP-133.

HAGAN CORPORATION
HAGAN BUILDING, PITTSBURGH 30, PA.

HAGAN

Systems and Components for: Aeronautical Testing Facilities, Process Control, Boiler Combustion Control, Metallurgical Furnace Control • Industrial Water Treatment • Chemicals for Water Conditioning

HAGAN SUBSIDIARIES: CALGON, INC. • HALL LABORATORIES, INC.

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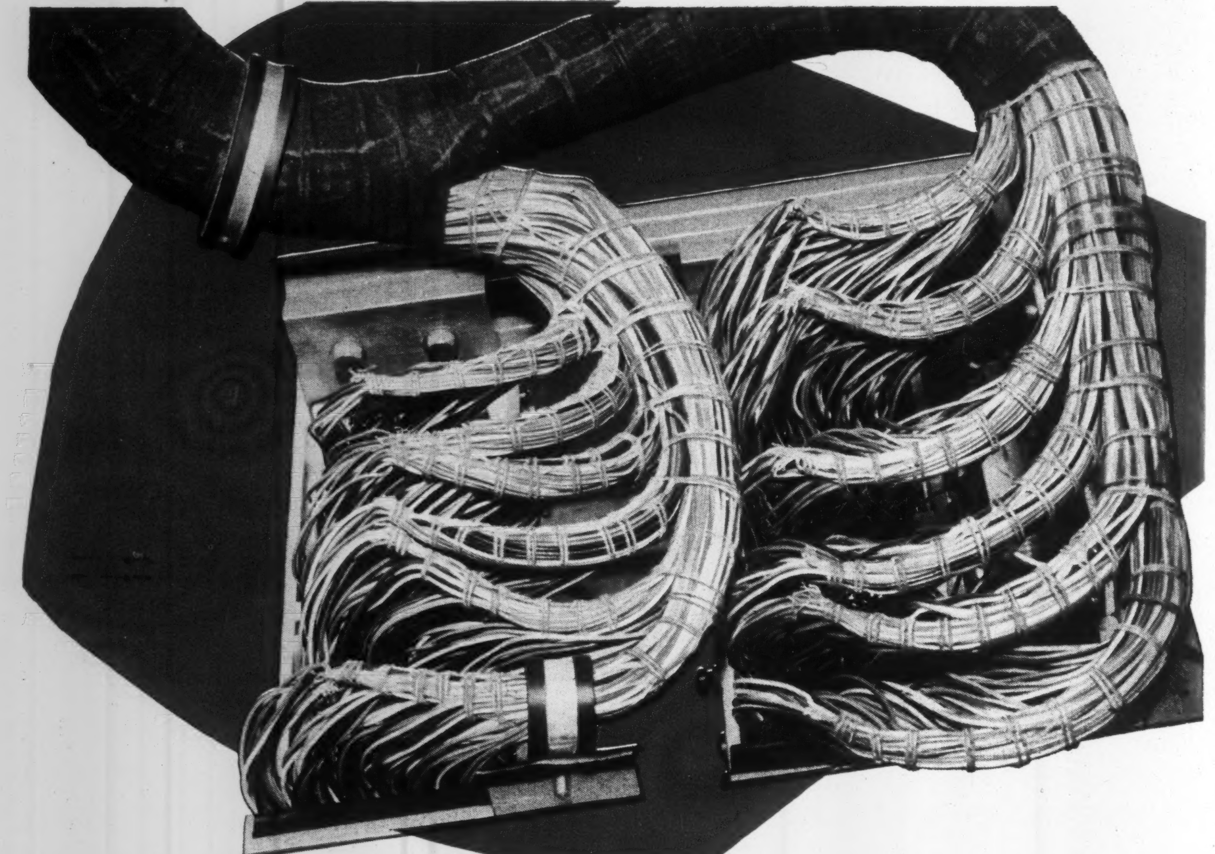
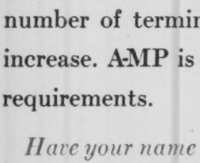


Here's One Reason Why You Should Know About A-MP Terminals

A-MP meets the requirements of modern business machine and computer manufacturers for reliable, miniature wire terminations which can be installed at high speed. As the complexity of circuits and number of terminations increases, so must the dependability, efficiency and ease of application increase. A-MP is constantly working to develop better and better solderless wiring to meet these requirements. *©1955 A-MP A-MP Trade-Mark Reg. U.S. Pat. Off.*

Have your name put on the A-MP mailing list to receive valuable information about these developments

Examples of the advanced thinking that is part of all AMP solderless wiring devices: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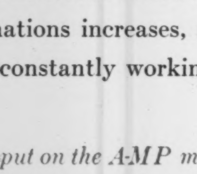
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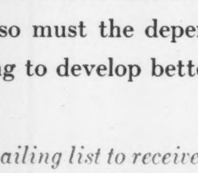
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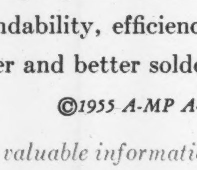
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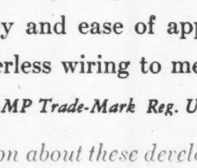
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A-MP TAPER PINS (1) and TAPER TAB RECEPTACLES(2) designed to save space and weight in electronic circuitry. A-MP Pre-Insulated Diamond Grip Terminals (3) eliminate tape and spaghetti and are used extensively by every major aircraft producer. A-MPLIVAR Splices (4) speed production for mass produced motor windings, transformers, etc., using enamel, poly-vinyl acetal or similarly coated wire. A-MP FASTON Terminals (5) for all kinds of electrical appliances have revolutionized harness sub-assembly methods.

AIRCRAFT-MARINE PRODUCTS INC.
2100 Paxton Street, Harrisburg, Pennsylvania
IN CANADA: Aircraft-Marine Products of Canada, Ltd. 1764 Avenue Road, Toronto 12, Ontario, Canada

A-MP

For more information circle **16** on inquiry card.

The Big Hot Wind in the Open Hearth

Panhandle Pete

I read in the March issue of this magazine where Mr. J. J. Pollard of Manning, Maxwell and Moore, Inc. is suspicious of our Uncle Milton's motives and also believes that there is "little of moral or cultural value, strictly speaking, within the contents of your publication." Hmmmmmm! I am tempted to agree with Mr. Pollard for, in the words of Oscar Wilde —The old believe everything, the middle-aged suspect everything, the young know everything. Besides, who ever reads so many favorable "letters to the editor" as you do in this magazine?

As to the other complaint I can only say that Milton is trying to edit the most up-to-date authoritative magazine in the field of instrumentation (Can't you D.R.'s picture the big vacuous smile on M.H.A.'s face as he reads this?) and if you have read these columns of mine you will understand, loosely speaking, where the cultural value of the magazine lies. Why certainly there are cultural items! When Milton and I were at Carnegie Tech a cultural subject was one which we didn't think had much to do with engineering—english, history, etc. What other writer (writer? —Ed) for *Instruments and Automation* strays so far from the field of instruments as Panhandle Pete? A good "ferinstance" was the description, by the Editor of the *Simulation Council Newsletter* for April, of how he used to whistle for wind on Lake Pontchartrain. When I was younger and sailed boats on the Ohio River, we would sometimes find ourselves faced with a long row home so we whistled and threw water on the sails. (Now that all you D.R.'s know how to make the wind blow I do not want to see any more of this culture in this magazine. Ed.) As another "fer instance" I have written up a discussion of instrumentation for open-hearth furnaces that someone told me about over a strong cup of coffee. Culturally, I think this is a dilly! It goes something like this:

A. Why do we pay a first helper some fifty dollars* for an eight hour day? Is it for opening and closing some valves and pushing a button every ten or fifteen minutes? Is it for opening and closing furnace doors every once in awhile? Or is it to make changes on various controls which no one knows too much about? No, I don't think so; we could teach common labor to do these jobs.

B. What kind of people are these first helpers? Well these people range from *excellent* to *poor* in any classification you care to name. Since there is no formal education program in the mill for these people it seems to me the future first helpers will be about the same as the present one.

C. What kind of control systems are we apt to install in the future for controlling a furnace? The present trend is towards more and more instrumentation until we surpass the glorious confusions installed in the past.

D. What do we do with all this control? The daily charts? Or anything else pertaining to the control so long as it operates? Generally speaking, no one looks at the charts except the meter department (sometimes I wonder if we do not furnish all these recorders just to help keep our own men busy). It is also common knowledge** that there are a great number of furnace settings which are not changed, and some settings which should be changed but are not, and still others which are set wrong.

E. What are the answers to these four questions? With regards to "A" I feel that these questions can be answered by saying that all these jobs are by-product functions which we derive from our fifty dollar a day man. His main job is to make steel! "B" I see no way to answer or solve the problems brought up by these people as per se. These people are a good example of homo sap in all his glory—forgetful, easy going, hard-working and so forth, but for fifty bucks a day you'd like to have a combination metallurgist, combustion engineer, instrument man and crystal-ball gazer, wouldn't you, hmmmm? Since there are few individuals as just described this brings us back to homo sap again. I expect to discuss "C" a little later on. And "D" brings up a subject so involved with the other three questions that I have but one answer and it isn't too good: employ a crew of men to operate the furnaces. This would immediately increase labor cost and invite friction with the present personnel.

F. So what do we do about this problem? First of all we have to assume the first helper knows how to make steel*** and since we have also assumed we are paying him this fifty dollars for making steel we should give this man tools to allow him to make all the steel he can. We do this by eliminating operating errors and confusion and end with a new type control system consisting of (1) a large gauge and (2) a selector switch. The gauge will have a red-colored dial with a small green sector in the center. The selector switch will have positions marked 'Melt Down', 'Work Lime' and so forth as needed. Thus if the first helper knows what his heat is doing or what he wants it to be doing, any given setting on the selector switch will pre-set all the furnace functions to optimum setting and the large gauge will read "in the green" if all the functions are as called for.

G. What will we accomplish with this one knob and gauge control system? Obviously this control will have the advantage of utter simplicity from the operations angle. We will

"IT'S NOT THE 'KNOW HOW', IT'S THE 'WHERE AT'"

Continued on page 1914

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* Insert your own pay scale for first helpers.

** I have listened to and read many reports from open hearth committee meetings and have come to the conclusion that operators are unhappy with present controls, first helpers, maintenance of control and metermen in general.

*** This is a delicate subject.

VICTOREEN OFFERS A MEANS TO SAFETY FOR EVERYONE EXPOSED TO RADIATION

The ever increasing use of atomic and nuclear energy in manufacturing and processing industries requires ultimate safety measures for the protection of *all persons,* even those casually exposed to radiation. Radio active products affect not only people involved in production processes but in all handling services such as receiving, shipping and transportation. And it is these marginal contacts that can be most severely affected by radiation, for which Victoreen Personal Dosimeters offer a complete measurement of safety.

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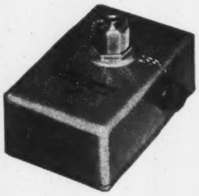
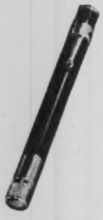


INDIRECT READING POCKET DOSIMETERS



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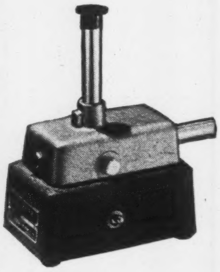

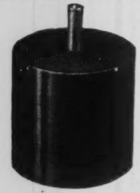

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PANHANDLE PETE—CONT.

have the benefit of optimum furnace settings for any given operation. Our first helper can make steel without worrying about these little chores we bother him with now*. It is no longer necessary to have a high-priced panel located on higher priced real estate.

H. Who selects the pre-set settings for the furnace functions**?? This is easy to answer. In the language of the open hearth, "Who raises hell with the first helpers when they aren't running the furnaces right" at the present time? Usually this hell-raiser is the superintendent or one of his deck-hands. In some of the more enlightened shops there is an individual of genus engineerus combustiblus and he throws a lot of, er, weight. In any event if you do not allow this hell-raiser to make the settings, you might as well go home because he'll never be satisfied—even if you are right.

I. How does one know what settings are best? Don't be ridiculous! How long have you been reading this magazine? (I was going to be naive and say that experience is the best teacher for control setting, but this is 1956 and the age of the computer.) Every reader of *I&A* now knows all about analog computers and how you just push a few buttons, twist a few (hundred) knobs, plot a few curves and come up with the "optimum."

J. Cost? If we do away with all the recorders and used indicators instead, and placed these control panels out of the way instead of where we do, and make them look less like show cases, we might just save enough money to pay for a one-knob-and-gauge control. Otherwise the cost of this simplified control might run about 10.2% in addition to the original cost of the control. But if we add the cost of the computer with which we are going to find out how to determine the optimum settings of the furnace controls, the amount involved—compared with the tremendous improvement in production and furnace life is a piddling amount—just ask any computer salesman!

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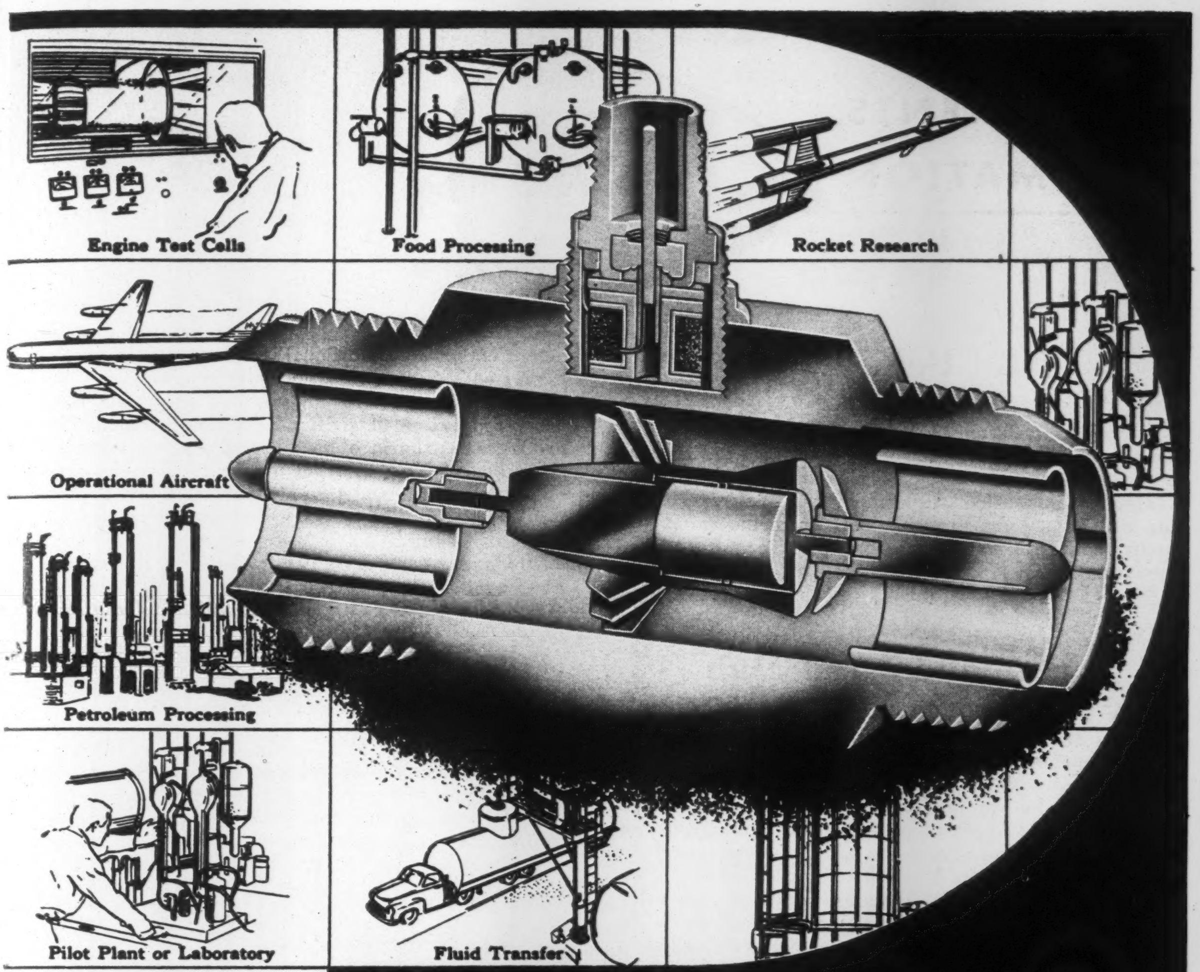
*A few of the first helpers do worry once in awhile.

**These functions are those which you operators growl about not being watched. It is obvious that there is some combination of settings which is best for any furnace which will yield the most tonnage with best furnace life over a period of time.

Panhandle Pete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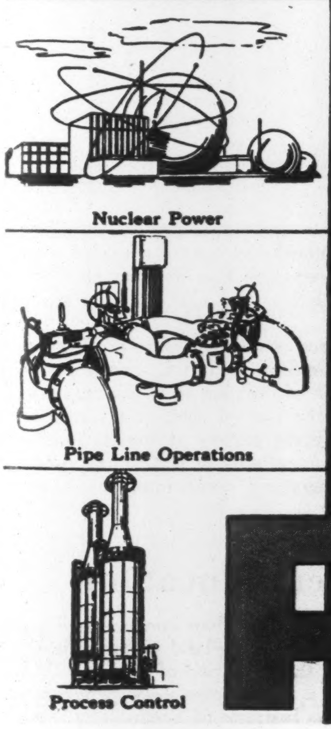
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INSTRUMENTS and AUTOMATION News

NBS Relocation

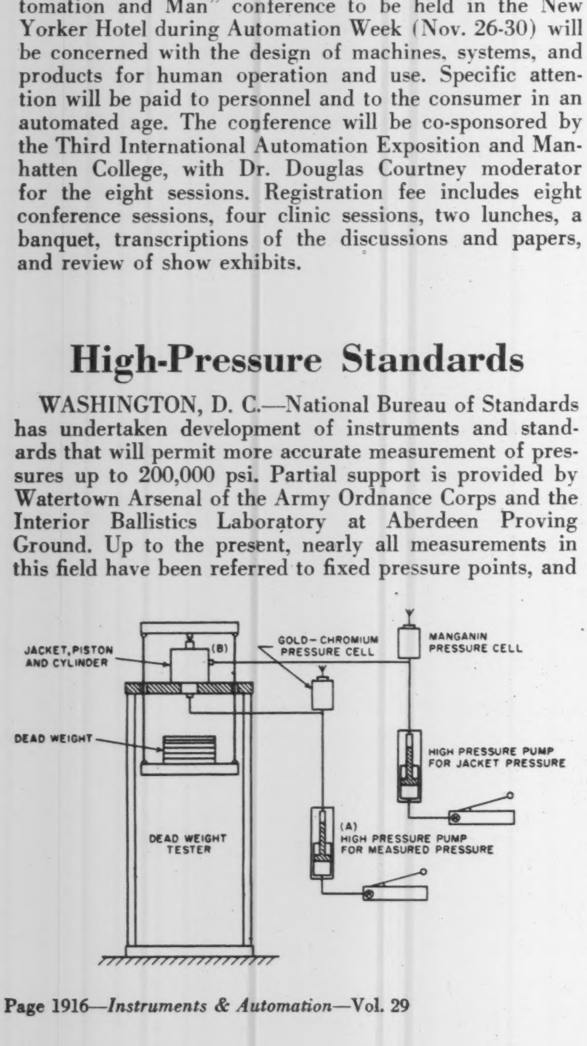
WASHINGTON, D.C.—The National Bureau of Standards will relocate to 550 acres of land near Gaithersburg, Maryland. The new site will enable the Bureau to plan for a more up-to-date plant consistent with its continually increasing responsibilities. The rural location will remove the Bureau's work from the variety of mechanical, electrical, and atmospheric disturbances present in a city.

Automation and Man

NEW YORK, N. Y.—The "Human Engineering—Automation and Man" conference to be held in the New Yorker Hotel during Automation Week (Nov. 26-30) will be concerned with the design of machines, systems, and products for human operation and use. Specific attention will be paid to personnel and to the consumer in an automated age. The conference will be co-sponsored by the Third International Automation Exposition and Manhatten College, with Dr. Douglas Courtney moderator for the eight sessions. Registration fee includes eight conference sessions, four clinic sessions, two lunches, a banquet, transcriptions of the discussions and papers, and review of show exhibits.

High-Pressure Standards

WASHINGTON, D. C.—National Bureau of Standards has undertaken development of instruments and standards that will permit more accurate measurement of pressures up to 200,000 psi. Partial support is provided by Watertown Arsenal of the Army Ordnance Corps and the Interior Ballistics Laboratory at Aberdeen Proving Ground. Up to the present, nearly all measurements in this field have been referred to fixed pressure points, and determination of additional fixed points is needed as higher and higher pressures come into use.

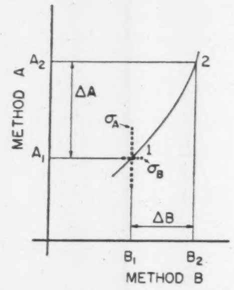

JACKET, PISTON AND CYLINDER
(B)
GOLD-CHROMIUM PRESSURE CELL
MANGANIN PRESSURE CELL
DEAD WEIGHT
HIGH PRESSURE PUMP FOR JACKET PRESSURE
DEAD WEIGHT TESTER
(A)
HIGH PRESSURE PUMP FOR MEASURED PRESSURE

Applications of high pressure and its measurement include production of artificial diamonds, manufacture of ordnance, extrusion of metals and plastics, operation of oil wells, a wide variety of operations in chemical technology (such as catalytic polymerization and hydrogenation), and study of the high pressures generated by nuclear explosions.

Illustration shows the calibration of a gold-chromium gage against the NBS controlled-clearance piston gage (dead-weight tester) in measuring the melting pressure of mercury at 0°C (about 110,000 psi).

Sensitivity Criteria

WASHINGTON, D. C.—National Bureau of Standards has introduced a more generalized form of the "sensitivity conceptor criterion" for instruments and methods of test. Underlying this concept is the requirement that a satisfactory method be both reproducible and responsive to changes in the objects measured. For example, comparison of two paper smoothness testers revealed a complex relationship between the two instruments which might have been misleading had the usual criteria of merit been used.



The ratio of sensitivities of methods A and B for measurement of a very small increment of property Q is: $\frac{\Delta A}{\sigma_A} \Big/ \frac{\Delta B}{\sigma_B}$.

Since $\frac{\Delta B}{\sigma_B}\left(\frac{\longleftarrow \Delta B \longrightarrow}{\sigma_B}\right)$ is greater than $\frac{\Delta A}{\sigma_A}\left(\frac{\longleftarrow \Delta A \longrightarrow}{\sigma_A}\right)$,

B is the better method although A is more responsive.

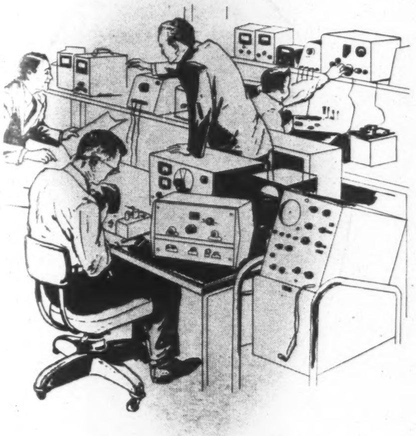
COMPARISON OF TWO METHODS FOR THE MEASUREMENT OF A PROPERTY Q

In the new generalized senitivity concept, *reproducibility* is measured by standard deviation, and *responsiveness* is measured by ratio of the change in the response to the change in the property studied. This criterion can be used to advantage in a great variety of studies involving either the comparison of methods of test or the determination of optimum operating conditions for a given method.

Computer Education

CAMBRIDGE, MASS.—More than one hundred scientists and engineers from New England colleges took the first step toward using the facilities of the new M.I.T. Computation Center at a special two-week program opened at the Massachusetts Institute of Technology, August

NOW-PORTABLE 400 cycle power



This new frequency changer makes it possible to provide well regulated 400 cycle power conveniently and quickly. This unit, Model FCR 250, is extremely useful in a wide variety of applications including testing, production, airborne frequency control, computers, missile guidance system testing, and in practically any application where the use of 400 cycle power is advantageous.

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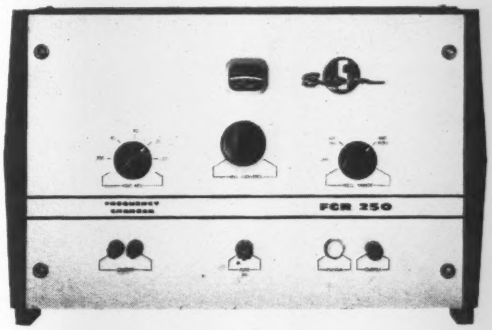

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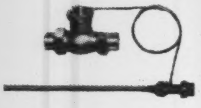
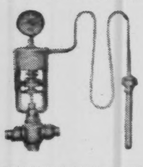
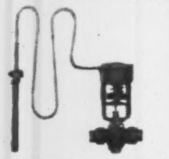
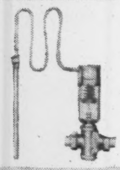
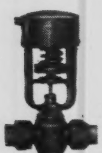

Nos. 928-D1, E1, F1 & G1 TEMPERATURE REGULATORS—control of liquid temperature in food processes, etc.

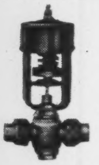

No. 999-T TEMPERATURE REGULATOR—for process control, water heaters, etc.

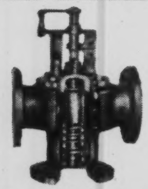

No. 999 TEMPERATURE REGULATOR—for liquids, air or gases in industrial processes, etc.

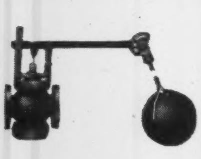
No. 923-Q TEMPERATURE REGULATOR—quick adjusting type for process control, etc.

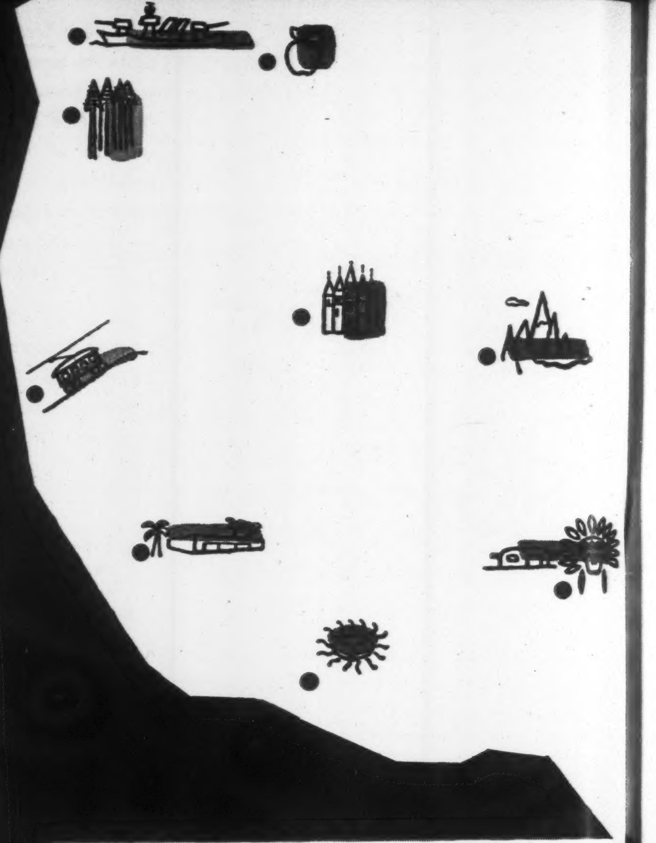

No. 926 TEMPERATURE REGULATOR—safety type for engines, process control, etc.


No. 992-D BELLOWS CONTROL VALVE—for use with Fultrol Pilot Controller, etc.


No. 992 PRESSURE REGULATOR


Nos. 1280 & 1281 TEMPERATURE REGULATORS—for engines, process water, etc.


No. 1620 FLOAT VALVE—for liquid level control.



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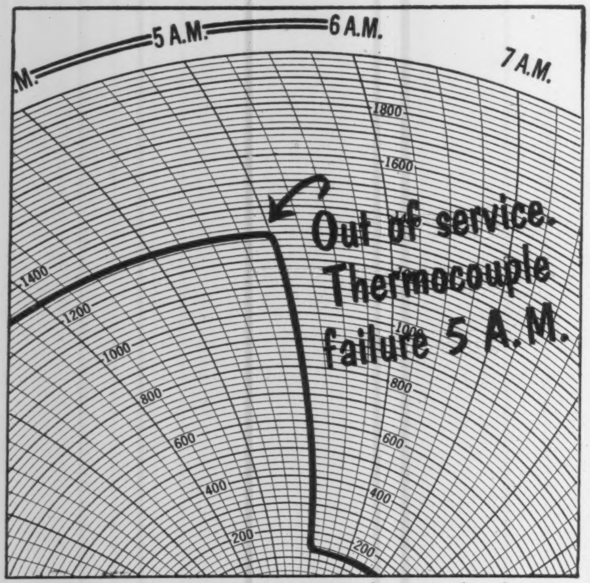

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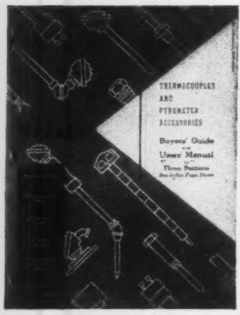

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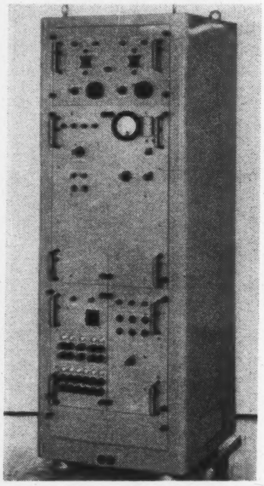
6.18

BRISTOL *Points the Way in Human-Engineered Instrumentation*

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

For more information circle **21** on inquiry card.

20. The program, marking the opening of a cooperative venture between the International Business Machines Corporation, M.I.T., and at least 23 other New England colleges, is designed to increase the number of scientists and engineers qualified to use computing machines by teaching the principles of preparing problems for computation. Under special arrangements with I.B.M., a type 704 computer will be installed early next year, for operation at the M.I.T. center.



R-θ by Bits

SAN DIEGO, CALIF.—The Navy Electronics Lab., San Diego, has received delivery of Electronic Engineering Co. equipment for conversion of bearing and range information into digital form suitable for transmission over radio voice communication links. The unit has two channels, each of which represents the positions of each shaft of a two-speed synchro system with a 12-digit number.

Rimbach Addresses ASME and IRE Meetings

PITTSBURGH, PA.—Richard Rimbach, publisher of *Instruments & Automation, Instrument & Apparatus News* and *Military Automation* will address the November 15 joint meeting of the metropolitan section of ASME and New York Society of Professional Engineers on the subject of "Automation in the Future," and will act as Chairman of the session on Industrial Applications of Instrumentation at the IRE Instrumentation Conference & Exhibit, sponsored by the IRE Professional Group on Instrumentation, Dec. 5-7, Atlanta, Biltmore Hotel.

Digital Reports

WASHINGTON, D.C.—The Office of Technical Services, U.S. Department of Commerce, has released the following reports: (1) "An Experiment in Universal Coding," S. Gorn, Ballistic Research Laboratories, U.S. Army. Aug. 1955. 83 p. $2.25: Order PB121055 from OTS, U. S. Department of Commerce, Washington 25. (2) "High-Speed Reader for Perforated Tape," R. J. Bianco, Ballistic Research Labs., U. S. Army. Sept. 1955. 17 p. $.50: Order PB121057 from OTS. (3) "A High-Speed Shift Register," S. R. Ray, Ballistic Research Labs., U. S. Army. Sept. 1955. 14 p. $.50: Order PB121060 from OTS. (4) "Medium-Speed Digital Plotter," P. M. Kintner and E. A. White, Ballistic Research Labs., Oct. 1955. 35 p. $1: Order PB121056 from OTS. (5) "Sonar Digital Recorder—Digiter," A. G. Pieper and R. Q. Tillman, Naval Research Lab. June 1956. 10 p. $.50: Order PB121220 from OTS.

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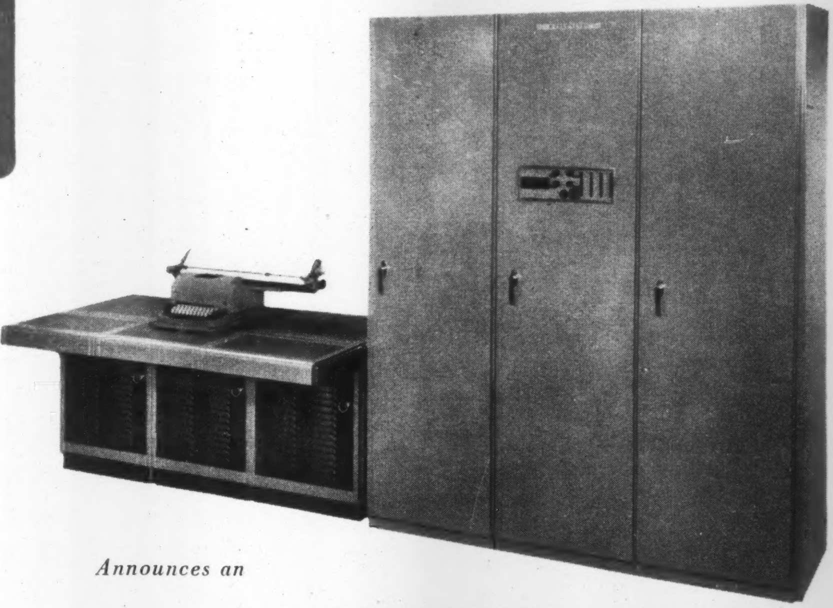

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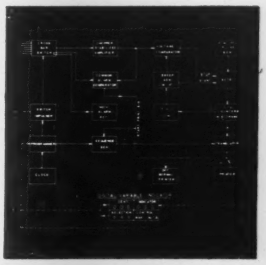
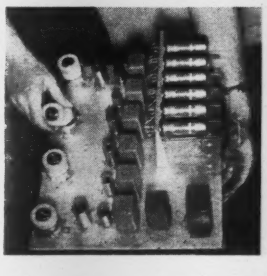




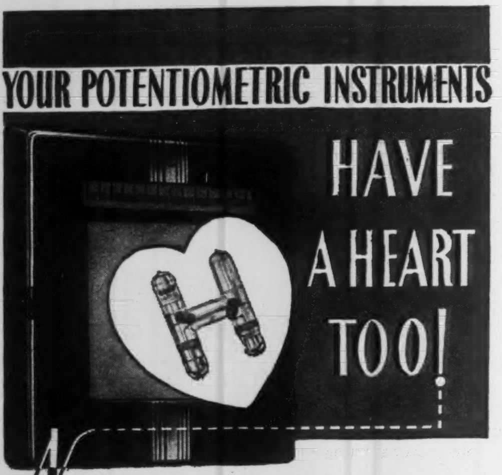
KYBERNETES®

Write for Bulletin '108'

THE KYBERNETES CORPORATION

Executive Offices:
9 East 40th Street
New York 16, N. Y.
MUrray Hill 3-6030

For more information circle **22** on inquiry card.



NO matter how perfect otherwise, the human organism isn't much good without a dependable heart. The same is true of your automatic temperature and pH control instruments.

The "heart" of most such instruments for the past quarter century has been the Eplab Standard Cell. It is a "yardstick" for translation of voltage to temperature or pH. The first American commercial cell of its type, constantly improved by research, it is "as standard as sterling".

Get ACCURATE temperature or pH control with potentiometers and make sure the standard cells are EPLAB.

The Eppley Laboratory, Inc. 2 Sheffield Ave., Newport, R. I.

EPLAB *Standard* CELLS
FOR POTENTIOMETRIC INSTRUMENTS
"As Standard as Sterling"

For more information circle **23** on inquiry card.

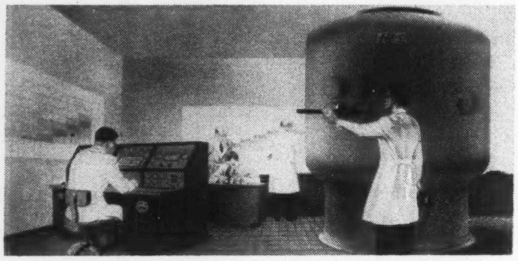
NEWS—CONTINUED

Automatic Tube Testing

COLLEGE POINT, N. Y.—New "DynaMatic" tube tester by TeleTest Instrument Corp. uses perforated cards to automatically set up pin connections and test voltages to tube sockets on the test panel. Setting heater voltage and a 'calibration' control are the only manual operations required in set-up. Inserting the punch-coded tube-type card automatically turns the tester on; withdrawing the card turns it off. The coded contacts are made by plated steel balls pressed against contact strips by phosphor-bronze coil springs.

Mass-Produced Reactors

SAN RAMON, CALIF.—Aerojet-General Nucleonics announces it is beginning the world's first mass-production of small portable self-contained nuclear reactors. Using a method of core fabrication with radiation-stabilized polyethylene moderator, the reactor resembles a liquid homogeneous reactor but actually has a solid homogenous core. The requirement for critical mass is approximately 600 grams of Uranium 235 of 20% enrichment, said to be less than any known reactor.



Transistor News

PHILADELPHIA, PA.—Philco Corp. announces a new technique for the mass production of UHF transistors. New MAT and SBDT devices are fabricated from the element germanium and utilize surface barrier technique; the SBDT will operate at 500 Mc.

Missile Simulation

VAN NUYS, CALIF.—A UNIVAC Scientific 1103A of Remington-Rand, which will solve some problems involved in intercontinental ballistic missiles, will soon be put into operation by Lockheed's Missile Systems division. The machine is said to be the only machine in the world versatile enough to interrupt one complex problem to solve a new, high priority problem, while retaining all work on the first in its "mind" for subsequent solution.

NSF Colloquia

WASHINGTON, D.C.—National Science Foundation has released the following schedule for the 1956-57 NSF Colloquia Series. All meetings will be held in the board room of the Foundation, 1520 H. St., N.W., Washington,

"Our lab is seeking work we used to turn away...

0 1 2 3 4 5 6 7 8 9 10

...we cut our analysis time to one-fifth with our NEW G-E XRD-5 X-Ray Emission Spectrometer"

THE above statement from a large steel foundry reflects the contribution of this versatile General Electric apparatus to analysis programs in chemical, rubber and petroleum plants, as well as in metallurgy.

G.E.'s new X-Ray Emission Spectrometer has proved far faster and more precise than wet methods for quantitative analysis of elements down to atomic number 12 (magnesium). And because the technic is non-destructive, re-runs can be made immediately without preparing another sample.

Whatever your analysis requirements —research, raw materials or quality control — this General Electric diffraction unit can be adapted to your exact needs. Our x-ray representative near you will be glad to recommend the facilities best suited to your work load. Or write to X-Ray Department, General Electric Company, Milwaukee 1, Wisconsin, for Pub. BL-104.

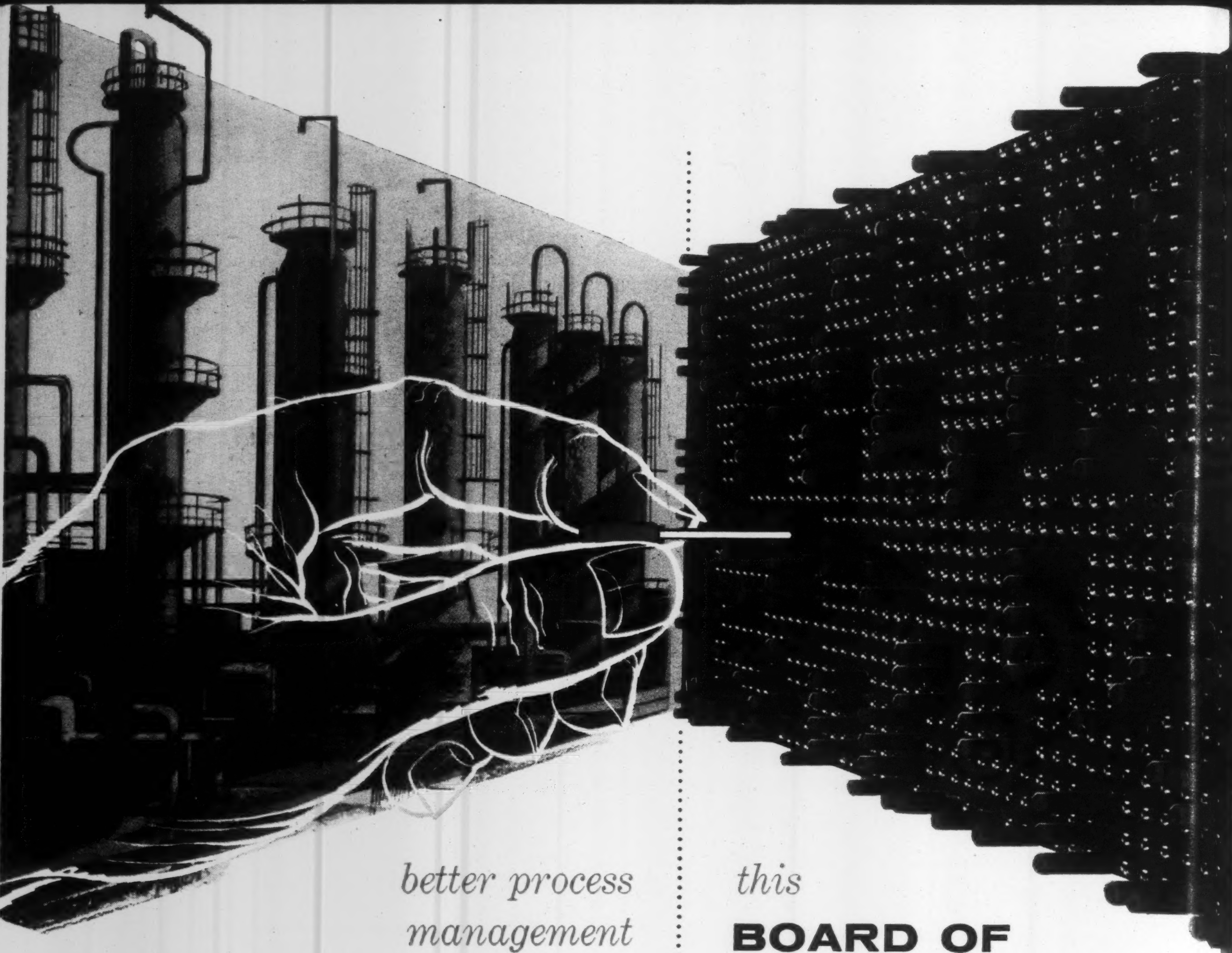
HELIUM ATMOSPHERE and a flowing gas proportional counter help detect small atomic number elements.

XRD-5S SPECTROMETER may be used exclusively for chemical analysis or quickly rearranged as a diffractometer for crystal analysis.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more information circle **24** on inquiry card.



better process management starts with this BOARD OF DIRECTORS

Whether you're responsible for managing a company or controlling a process, the Beckman "112" Data System – with exclusive PINBOARD PROGRAMMER – will help you do a better job.

How? By bringing you a *greater quantity* of *more accurate* operating data–in *useful* form–*immediately, instead of in days or weeks!*

Simply pin your instructions on the Pinboard, which, in turn, automatically directs the system to monitor the desired number of variables; record data on log sheets, cards, or tape; calculate material balances and product yields, and perform other functions. You are given a continuous picture of your plant operation–a chance to correct off-normal conditions and inefficiencies quickly, increasing product yield and quality.

"Magnetic core logic" – "floating" – semiconductor circuitry. Although these features in the "112" are of primary interest to the technical man, to the top executive they mean round-the-clock, round-the-calendar accuracy and reliability–data you can depend on, all the time. For complete information, write Beckman Instruments, Inc., Data and Control Systems Dept., Fullerton, Calif. Ask for Data File *D-2-47*

Our continued growth creates openings for creative engineers. Write for Career File No. 10.

Beckman "112" Data System, with exclusive "Pinboard Programmer".

See our Booth at the Automation Show

Beckman

scientific instruments

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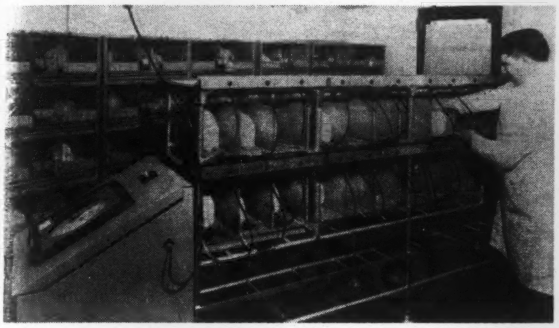
D.C. *High Energy Physics in the USSR* (Sept. 5); *Scholarship Problems and the Program of NMSC* (Oct. 3); *The Advancement of Science* (Nov. 7); *Genetics in Japan* (Dec. 5); *High School and College Mathematics* (Jan. 9, 1957); *Industrial Laboratory Research* (Feb. 6); *A Congressman Views Science* (March 6); *The Independent Research Lab.* (April 3); *New Horizons in Biological Research* (May 1); *Impact of Science Support on Higher Education* (June 5).

Pyrogen Testing

RENSSALEAR, N. Y.—Fielden Instrument Div. and Winthrop Laboratories have developed new electronic equipment for automatic and continual recording of body temperatures in testing for pyrogens. (fever-creating substances, derived from living things while free of living bacteria themselves). Measures to exclude pyrogens from intravenous preparations have been insituted by manufacturers of pharmaceuticals. The U.S. Pharmacopoeia sets forth exacting standards for testing as fatal results might occur in patients who need large amounts of intravenous fluids. Manual testing required one man fulltime to test 30-35 rabbits in one day. New equipment improves test control by providing a continuous record of temperatures for 48 tests per day, with only part-time attention by technicians.



Grass Automation

DALLAS, TEXAS—Automatic grass-growing machines can provide forage for livestock the year-round. The "Herbagere" machine, invented by a Belgian, transforms grain into grass seven inches high in six days. Fifty pounds of pre-germinated seed can produce three hundred pounds of (man-made) grass daily. The critical temperature is automatically maintained by a special control unit developed by Minneapolis-Honeywell.

News Bits

TRANS WORLD AIRLINES will install the first *coast-to-coast* electronic reservations network to be used by any airline. A Teleregister "Magnetronic" system will keep track of the availability of all seats on TWA flights, domestic for 31 days and overseas up to six months in advance.

NUCLEAR DEVELOPMENT CORP. has been authorized to develop a sodium-deuterium reactor in part-

WEKSLER INSTRUMENTS

for INDICATING, RECORDING & CONTROLLING TEMPERATURE, PRESSURE AND HUMIDITY

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Cat. 125A Industrial Thermometers
Cat. 225A Glass Engraved Stem Thermometers and Hydrometers
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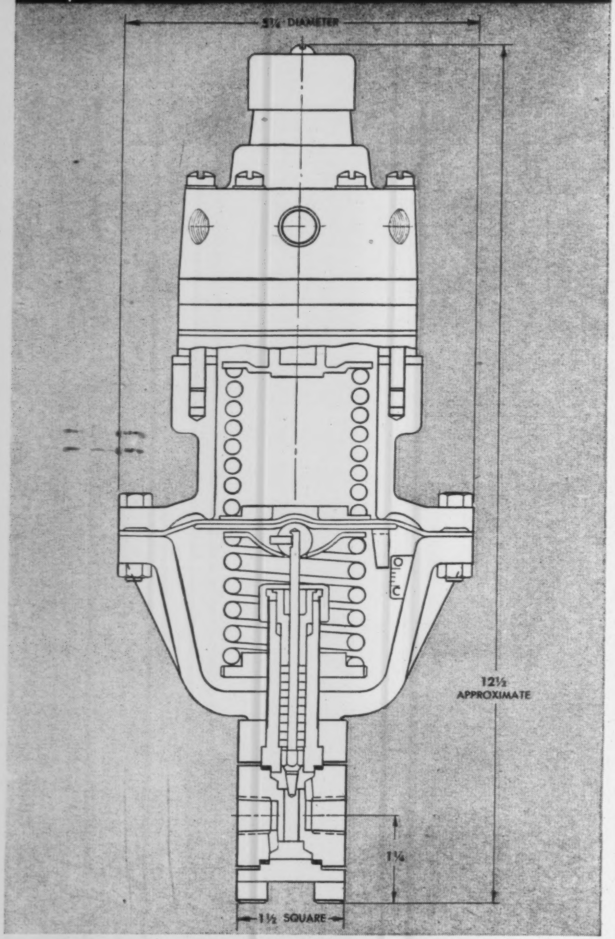
MINIATURIZED CONTROL



COMPACT • ACCURATE • RUGGED

Throttling 500 Series Bantam Diaphragm Control Valve with Top-mounted Moore Positioner.*

High Lift-Positioning Accuracy
Low Cost — Weight — Size

Valve Sizes — 1" Screwed or Flanged to ⅛" Screwed.
Trim Cv — 12.0 to 0.001.
Pressures — 0 to 2000 psi.
Temperatures — Minus 400 to Plus 1000° F.

*Other Positioners and Instruments Mountable on 500 Series Valves.

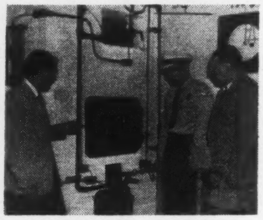
Write us for complete technical information, or the address of our representative in your area.

George W. DAHL Company
BRISTOL, RHODE ISLAND

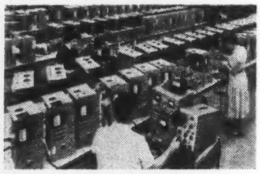
For more information circle **27** on inquiry card.

nership with the AEC and the Chugach Electric Assoc., Anchorage, Alaska. The proposal is for a power reactor of 10,000-kw capacity, using heavy water as moderator, liquid sodium as coolant, and slightly enriched uranium as fuel.

MINNEAPOLIS-HONEYWELL electronic relays control a new incinerator control system for use in the Department of Health Bldg. in Santa Ana, Calif.



M-H Electronic Relays



Berkeley Control

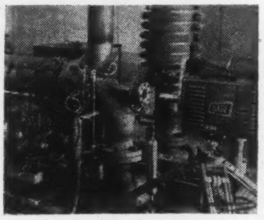
BERKELEY DIV., Beckman Instruments has introduced Statistical Quality Control to check out products at seven stages in the manufacturing process, beginning with inspection of parts received from outside suppliers. New method is said to cut possibility of defects in finished instruments by 50%.

PLANET VENUS is the presumed source of Morse-code-like signals recently reported by Ohio State Univ. radio astronomer.

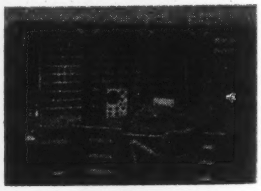
CHICAGO APPARATUS CO. now offers Service and Repair Policies, similar to the coverage purchased by many television set owners, to industrial users of *scientific instruments.* Periodic inspections, preventive maintenance, and emergency service are included.

MINE SAFETY APPLIANCES COMPANY has armed Cincinnati inspectors with CO Testers in a war declared on "The Silent Killer."

DAGE CLOSED-CIRCUIT TV is being used by Ford Motor Co. for remote observations of flame patterns in combustion chambers, critical engine linkages, and characteristics of engine lubrication—all too hazardous for direct observation by personnel.



Dage Closed-Circuit TV



ALWAC

TWO PROCESS APPLICATIONS OF ALWAC computers are reported from the petroleum industry. One, installed at the Southwestern Computing Center, Tulsa, Oklahoma, solves complex oil and gas industry problems. The second, sold to Champlin Refining Co., Ft. Worth, Texas, will be used to compute the precise balance in blending crude oil, to realize maximum profit at minimum cost.

POCKETSCOPES®

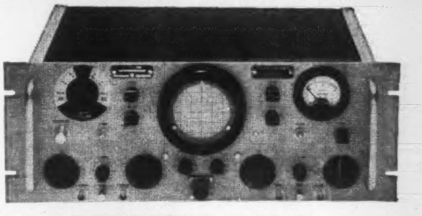
PULSESCOPES®

RAKSCOPES®

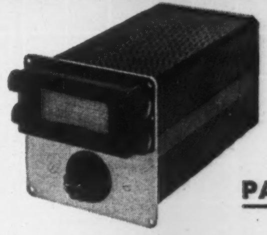
PANELSCOPES®

RAYONIC TUBES®

SYSTEMS CONCEPT



RAKSCOPE S-12-C



PANELSCOPE®

The Waterman SYSTEMS RAKSCOPE, S-12-C series is a rack mounted oscilloscope with SYSTEMS CONCEPT. Systems concept is a basic means for rapid monitoring of desired signals with minimum operative effort and without the use of auxiliary switching or jack panels. S-12-C series provide the following:

1. BASIC UNIT—The basic S-12-C SYSTEMS RAKSCOPE is a complete combination systems monitoring and trouble-shooting oscilloscope with outstanding physical and electrical characteristics. The RAKSCOPE occupies but 7 inches of a standard 19″ rack and extends only 10 inches behind the front panel. Identical vertical and horizontal amplifiers are DC type having rise times better than 0.35 usec, and 50 or 71 millivolts rms per inch of deflection respectively. Signal calibration method uses a direct reading accurate meter. Time base sweeps are from ½ cps to 50KC in trigger or repetitive operation. Sync from internal or external sources provide stable operation by means of new sync lockout circuits. Special plug-in elliptical sweep circuit for easy phase and frequency checks greatly increase its systems utility. Construction is ruggedized throughout. Tube type options include standard commercial, ruggedized commercial or ruggedized military. Operable from 50 to 400 cycles.

2. CUSTOM MODIFICATION—Desired flexibility is obtained with the optional signal input selector. For the first time it is possible to select up to eleven different signal sources with the necessary built-in attenuation (supplied by us or by you) for each source. Thus the entire switching panel can be omitted from an overall system resulting in circuit and space economics. Standard elliptical sweep is 60 cycles, but plug-in units for other frequencies can be supplied. Accessories such as attenuating, direct, and amplifying probes are available.

Improve your existing or contemplated systems by including the S-12-C SYSTEMS RAKSCOPE as an integral part. Your local Waterman representative is ready to assist you in determining specific requirements.

The Waterman PANELSCOPE is a custom-built cathode ray tube oscilloscope, with simplified operation, and yet available at a low price. The PANELSCOPE concept provides for the following:

(1) MINIATURIZATION—Panel space required is only 5¼″ x 5-3/16″—depth is 10″ and the weight is less than 7 lbs. The PANELSCOPE can be installed in practically any equipment—mobile or stationary—air, sea, or land—military or commercial.

(2) SIMPLICITY OF OPERATION—Twist of a single rotary switch provides a synchronized pattern of desired incoming signal (up to 11 circuits) against proper linear time base. This is ideal for monitoring and trouble shooting, as it removes the need of fiddling with knobs as is done now on general purpose oscilloscopes. The static controls, such as beam, focus, positioning, and graticule brightness are located in tube escutcheon.

(3) CUSTOM DESIGN—A wide variety of—signal amplifiers with response from dc to megacycles and sensitivities from 5 millivolts—synchronized or triggered linear time base generators from ½ cycle (and lower if need be) to 2 microseconds—can be specified by you to fit your needs for particular equipment.

(4) PARTIAL KIT FORM—the PANELSCOPE comes fully wired and tested with chosen signal amplifier, linear time base generator and attendant sync. amplifier. The desired signal attenuators, frequency and amplitude determining components, and method of synchronization can be installed either by us or by you.

(5) POWER REQUIREMENT—Less than 10 watts of line power for built-in high voltage supply—The required B+ and heater current as selected by your requirements. For those cases where B+ and heater power is not available, auxiliary power pack can be supplied.

There is a place in your equipment for Waterman PANELSCOPE, a custom built oscilloscope at production prices, although your needs may be but one or two. Ask for specification sheets either from our representatives or direct from the factory.

RAYONIC CATHODE RAY TUBES BY WATERMAN

TUBE	PHYSICAL DATA		STATIC VOLTAGE		DEFLECTION*		LIGHT OUTPUT**
	FACE	LENGTH	A3	A2	VERT	HOR	
3JP1	3″	10″	3000	1500	111	150	40
3MP1	3″	8″		750	99	104	4
3RP1	3″	9.12″		1000	61	86	5
3SP1	1.5x3″	9.12″		1000	61	86	5
3XP1	1.5x3″	8.875″		2000	33	80	22

**Deflection in volts per inch.*
***Light output of a line in millifoot lamberts per millimeter at line width not to exceed .65mm.*

The basic properties of the cathode ray tube that concern the designer or the user are: deflection sensitivity, unit line brightness, line width, static voltage requirements and physical size. A comparison between cathode ray tubes manufactured by Waterman Products Company is shown in the table adjoining. These tubes are available in P1, P2, P7 and P11 phosphors. 3JP1, 3JP2, 3JP7, 3RP1, 3SP1 and 3XP1 are available as JAN tubes.

WATERMAN PRODUCTS

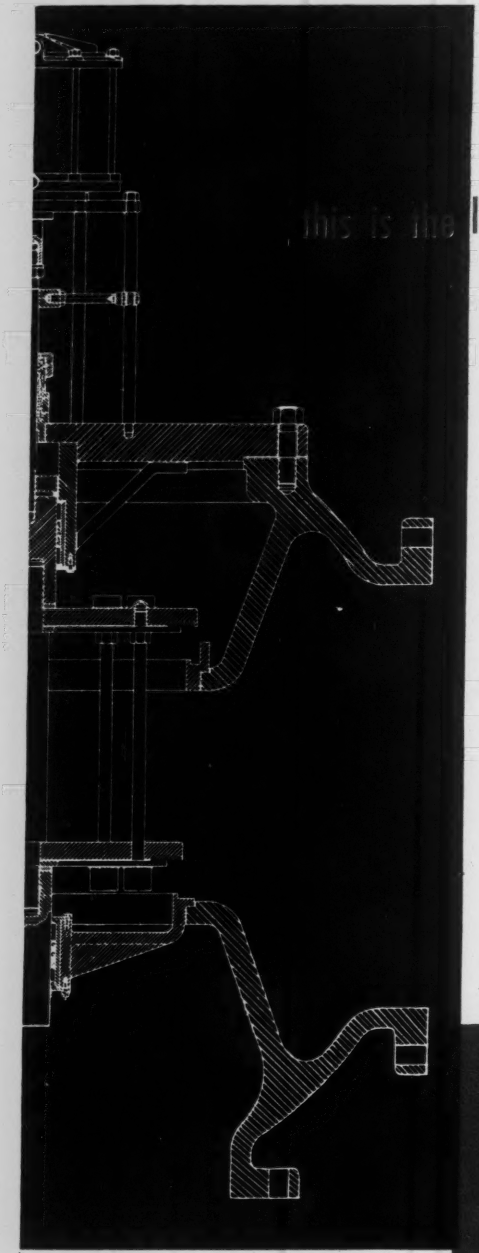
WATERMAN PRODUCTS CO., INC.

PHILADELPHIA 25, PENNA., U.S.A. • CABLE ADDRESS, POKETSCOPE, PHILA.

Manufacturers of Pocketscopes®• Rakscopes®• Pulsescope®• Panelscopes® and Rayonic® Tubes

For more information circle **28** on inquiry card.

this is the largest double-seated control valve ever made

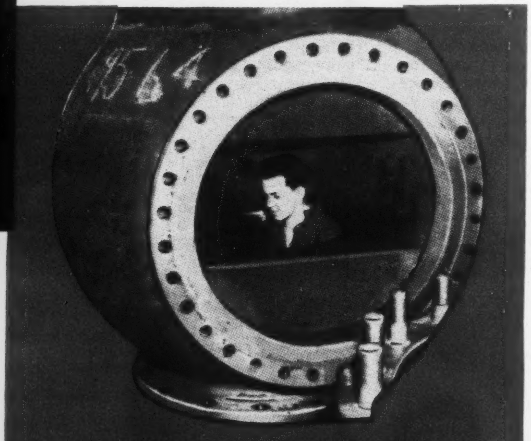


When you are talking *big* control valves, talk to Kieley & Mueller. K&M is the largest manufacturer of the big ones, control valves above 16 inches. Standard globe-type valves are available in 20, 24, 30 and 36 inch sizes; even larger valves will be produced on special order.

This 36-inch double-seated angle valve closes snugly on giant Teflon seats. The inner valve positions responsively, gliding on special roller-slide bearings. It's massive, but is operates protected by a K&M patented torque resistor. Beyond the problem of size, this valve is mounted on its side, and it has been performing creditably for over four years.

BIG or small, if it's control valves, you'll like the pitch-in, helpful approach of your local K&M representative . . . plus capable engineering and manufacturing follow-thru at the K&M plant.

Write for Bulletin CV-53.



ABOVE: Partial cross-section of K&M 36-inch valve showing general construction.

AT RIGHT: Actual size of a 36 inch valve can be visualized from this illustration of a workman inside the valve body performing finishing operations.

K&M

KIELEY & MUELLER, INC.

64 Genung Street • Middletown, New York

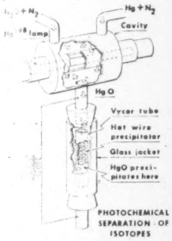
78th Anniversary . . . Oldest U.S. Pressure and Level Control Valve Manufacturer

For more information circle **29** on inquiry card.

NEWS—CONTINUED

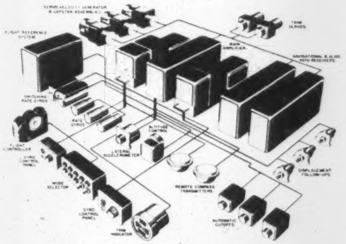
ELECTRONIC CAMERA that reproduces screened negatives is being developed by Fairchild Graphic Equipment, Inc.; 2,000 dots per second are exposed sequentially on photographic film with built-in tone controls adjusting the light beam for tailor-made plates.

PATENT awarded Dr. Bruce Billings, vp, Baird Assocs.-Atomic Instrument Co., is based on successful technique for photochemical separation of isotopes, resulting in enrichments of as much as 150%.



Hg + N2
Cavity
Hg198 lamp
HgO
Vycor tube
Hot wire precipitator
Glass jacket
HgO precipitates here
PHOTOCHEMICAL SEPARATION OF ISOTOPES

Billings' Patent



SERVO VELOCITY GENERATOR & CAPSTAN ASSEMBLIES
FLIGHT REFERENCE SYSTEM
TRIM SERVOS
MAIN AMPLIFIER
NAVIGATIONAL & GLIDE PATH RECEIVERS
SWITCHING RATE GYROS
RATE GYROS
ALTITUDE CONTROL
FLIGHT CONTROLLER
LATERAL ACCELEROMETER
GYRO CONTROL PANEL
DISPLACEMENT FOLLOW-UPS
MODE SELECTOR
REMOTE COMPASS TRANSMITTERS
GYRO CONTROL PANEL
AUTOMATIC CUTOFFS
TRIM INDICATOR

Lear electronic autopilots

AIR FRANCE has specified Lear electronic autopilots for all of its Caravelle jet transports—13 advanced automatic flight-control systems will be installed in the medium-range passenger aircraft now being built.

TWENTY-TON "UNIVAC" of Remington Rand was flown across the Atlantic to establish a computer service center at the Battelle Institute, Frankfurt, said to be the first such installation on the European continent.

"SIMULATION AND THEORY OF TRAFFIC FLOW" will be the subject of a two-week course given

What can you learn about
ANALOG COMPUTERS?

You can learn about . . .

Special-purpose analog computers for control of machine tools, rolling mill schedules, motor lamination production, and other specific industrial applications—includes analyzing the problem and determining the most effective computer approach—analog or digital.
Presented by Austin Company, in Room 553

Simulation and computation with the general-purpose analog computer, including practical applications on specific problems already solved—also new developments in automatic programming, setup, and checking—also new special-purpose digital computers.
Presented by Berkeley Division, Beckman Instruments, Inc., in Room 328

Setting up specific problems on the general-purpose analog computer, with emphasis on use of each element of the computer.
Presented by Electronic Associates, Inc., in Room 349

High-speed analog-to-digital conversion and data handling, featuring "DATRACS" 200,000 Conversions per second—emphasizing data sampling, band width, noise, etc.
Presented by Epsco, Inc., in Room 416

Simulation—the modern way to high-speed analysis of design, operation, and control of equipment.
Presented by Intercontinental Dynamics Corp., in Room 427

Operation and application of the general-purpose analog computer, with discussion of practical solutions for typical aircraft, process, and tunnel applications.
Presented by Reeves Instrument Corporation, in Room 333

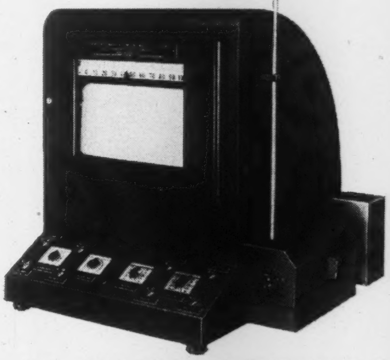
at the **ANALOG COMPUTER CLINIC** at the Third Automation Exposition. See page 1970 for registration coupon.

MEASURE AND RECORD THE DIFFERENCE

in refractive index in non-opaque liquid streams with the

NEW PHOENIX

automatic recording differential refractometer



Instrument shown is for mass-collection laboratory use. Other models available for process use. Limiting sensitivity 3 x 10^{-6}.

With this new precision instrument, you can plot refractive index changes in any non-opaque liquid stream, such as distillate or a chromotographic eluate.

The new Phoenix Automatic Recording Differential Refractometer makes possible extremely accurate qualitative and quantitative analysis of hydrocarbons, alkaloids, steroids, antibiotics, rare earths and other materials. It thus can facilitate accurate process control in chemical, petroleum, pharmaceutical, and many related industries.

Several models available for laboratory, process applications. Even the most sensitive has a 6600-unit range, without the necessity of changing cells or reference solutions.

MAIL COUPON FOR COMPLETE INFORMATION!

PPI

PHOENIX PRECISION INSTRUMENT CO.
PHILADELPHIA 40 PENNSYLVANIA

PHOENIX PRECISION INSTRUMENT CO.
3805 N. 5th Street, Dept. 01, Philadelphia 40, Pa.
Please send complete information on your new Automatic Recording Differential Refractometer for:
☐ measurement and recording in laboratory use.
☐ measurement, recording and control in continuous process use.

Name________________
Company________________
Street Address________________
City____________ Zone______
State________________

For more information circle **30** on inquiry card.

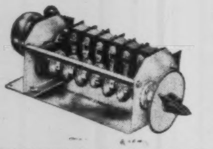
Be sure to see this modern

Zenith AUTOMATIC CONTROL EQUIPMENT

at the New York Show

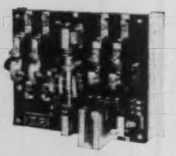
- 3RD INT'L. AUTOMATION EXPOSITION Nov. 26-30 . . . EXHIBIT 103

ZENITH MULTI-CIRCUIT CYCLE TIMERS



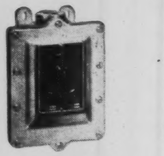
Specially designed to accurately time any electrical operation. Set for on and off periods with as many circuits as desired. Furnished with synchronous motor for elevator control, limit switch, etc.

ZENITH AUTOMATIC TRANSFER SWITCHES



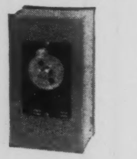
Automatic transfer to emergency source in 1/25th second . . . automatic return to normal voltage when restored. Supplied ac. or dc. Capacities up to 400 amps.

ZENITH INTERVAL TIMERS—MANUALLY PRE-SET



No clock springs to wind or break . . . powerful, self-starting, slow-speed, synchronous motor insures dependable operation. Timing ranges from 1 minute to 120 hours. 115 and 230 volt models.

ZENITH RESET TIMERS—AUTOMATIC, REMOTE CONTROL



Easily pre-set, automatically reset. Synchronous motor opens and closes circuits as preset. May be used as timer in conjunction with standard start-stop push button station.

ZENITH PROCESS TIMER—with new PERCENTAGE CALIBRATION

For Hold Fire Control, Mixing Machinery, Testing Equipment, Fans, Heaters, etc. Wide variety of models for all types of adjustable automatic cycle timing. Total time cycle from 15 seconds to 24 hours, with range of adjustability to 94% for ON or OFF periods.

OTHER ZENITH AUTOMATIC CONTROL EQUIPMENT

—switches, contactors, motors, relays, solenoids, etc.—will also be on display. And all are illustrated and described in the valuable Zenith Catalog. Ask for your copy at the Exposition . . . or write direct today.

ZENITH ELECTRIC CO.
159 W. WALTON ST., CHICAGO 10, ILLINOIS

For more information circle 31 on inquiry card.

NEWS—CONTINUED

by the Univ. of Calif., and designed to give traffic engineers a working knowledge of traffic simulation techniques.

FLEXLAB VOLTAGE DISTRIBUTION SYSTEM, costing close to a million dollars, will be installed at the Army Ballistic Missile Agency, Huntsville, Ala., by Standard Electric Time Co.

NATIONAL CASH REGISTER CO. has been granted a license to manufacture printed circuits by the Technograph process.

HOSEI UNIVERSITY, 7 Sinborityo, Azabu Minato-ku Tokyo, Japan has issued a technical report written by Prof. Shin'ichiro Takeda on the "Transmission of Oscillatory Pressures through Instrument Pipe Lines."

THE PHYSICAL SOCIETY, London, England has published a report on their meeting on Semiconductors held in collaboration with British Thomson-Houston Ltd. Report covers conduction in the impurity band junction rectifier theory, a semiconductor bond, etc.

Stock Report

The following prices and price ranges are supplied by Bache & Co. 36 Wall Street, New York 5, New York.

New York Stock Exchange:

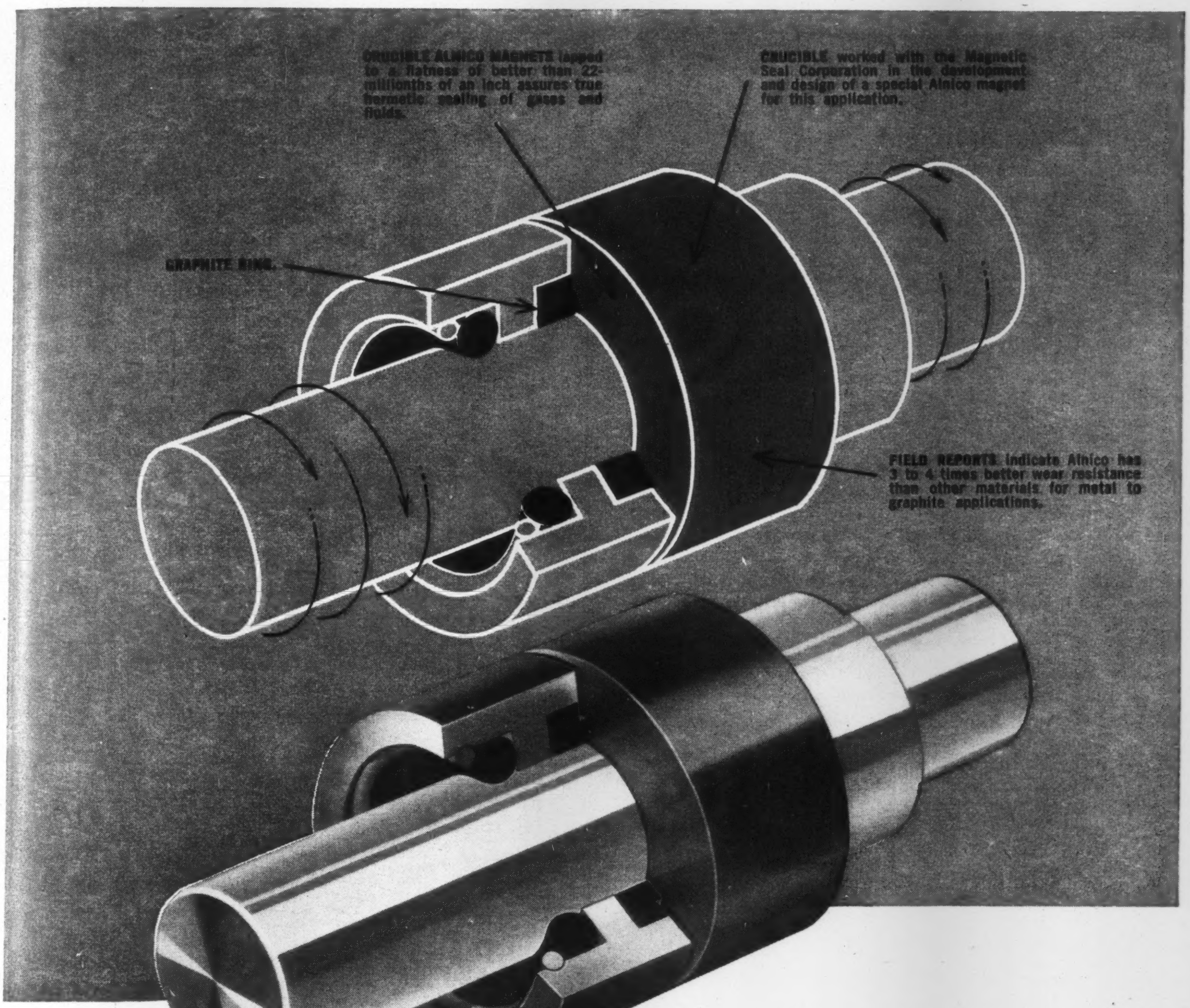
	Price Range for 1956 Thru July 31		As of July 31
Security	High	Low	Last
Aeroquip	15 3/8	11 7/8	14 3/8
American Chain & Cable	51 7/8	38 1/2	49 1/8
American Mach. & F.	32 1/8	24 1/8	28 3/8
American Mach. & M.	40 3/4	35 1/8	38 3/4
American Optical	40 3/4	34 1/2	36 1/4
Beckman Instruments	37 5/8	25 1/8	36 1/2
Bell & Howell	45 1/2	28 1/4	40 3/4
Bendix Aviation	63	48 1/2	53 3/4
Bulova Watch	23	20 1/4	21 1/4
Burroughs	44 3/4	28 1/2	42 7/8
Clevite	24 1/4	18	19
Dobeckman	39 1/4	31 1/4	32
Gamewell	32 3/8	25 5/8	32 1/4
General Inst.	10 1/8	7 3/8	7 5/8
General Prec.	53 1/2	37 1/2	43 1/4
General Time	33 1/8	29 1/2	32
Hamilton Watch	25 3/4	19	25 1/2
International Business Mach.	523	400	515
Minneapolis-Hon.	90 1/2	58	87 5/8
National Cash Reg.	59	34 1/8	55 3/4
Radio Corp.	50 3/8	41 1/8	42 3/4
Raytheon	19 1/2	13	13 7/8
Robertshaw-F.	28 3/8	21 1/2	23 3/8
Sangamo Electric	37 1/2	29 1/2	35 3/4
Sperry Rand	29 1/8	23 5/8	26 3/4
Square D	82	51 1/2	79 1/4
Starrett, L. S.	56 1/2	43 3/4	4 - 54 5/8 (1)
Sylvania Electric	55 7/8	42	53
Telautograph	15 1/4	11	13 1/2
Texas Inst.	15 1/8	11 5/8	13 1/2
Underwood	44	28 3/4	30 1/4

(1) Bid - Asked price, no sale.

American Stock Exchange:

	Price Range for 1956 Thru July 31		As of July 31
Security	High	Low	Last
Air Assoc.	13 1/2	9	9 7/8 - 10 (1)
American Meter	41	33	35 7/8
Benrus Watch	10 3/8	8 1/4	8 1/4
Breeze Corp.	9 1/8	6 1/8	6 1/4
Consolidated Electrodynamics	32 1/2	21	32
DuMont Labs.	10	5 3/4	6 1/2
Fairchild Camera & Instr.	25 7/8	19 1/2	24 3/8
Int'l Resistance	8 1/4	5 5/8	5 7/8
Lear Inc.	10 1/4	7 1/2	7 3/4
Nat'l Res. Corp.	29 3/4	17 7/8	22 7/8
Neptune Meter	36	28 3/8	35 1/4
New Haven Clock	2 1/2	1 1/2	1 1/2 - 1 3/4 (1
Norden-Ketay	14 7/8	9 5/8	9 7/8
Pneumatic Scale	28 1/4	24	25 1/4
Servomechanisms	10 3/8	8 1/4	9 7/8
Wallace & Tiernan	22 1/2	19 1/2	20 3/8
Waltham Watch	3	1 1/4	1 1/2

(1) Bid - Asked price, no sale.



CRUCIBLE ALNICO MAGNETS lapped to a flatness of better than 22-millionths of an inch assures true hermetic sealing of gases and fluids.

CRUCIBLE worked with the Magnetic Seal Corporation in the development and design of a special Alnico magnet for this application.

GRAPHITE RING.

FIELD REPORTS indicate Alnico has 3 to 4 times better wear resistance than other materials for metal to graphite applications.

in magnetic seals, too

CRUCIBLE PERMANENT MAGNETS

mean maximum energy—minimum size

The consistently higher energy product of Crucible Alnico magnets allows smaller parts—greater compactness in special applications like this magnetic shaft seal. What's more, the superior corrosion and wear resistance of Crucible Alnico insures far greater service life.

You can regularly get Crucible permanent Alnico magnets sand cast, shell molded, or investment cast to exact size, shape or tolerance requirements . . . and in any size from a mere fraction of an ounce to hundreds of pounds. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

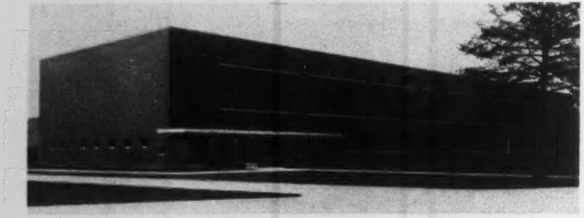
CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

For more information circle **32** on inquiry card.

New Plants and Mergers

BAILEY METER CO. announces a new two-story addition to their new plant in Wickliffe, Ohio, to be completed in July, 1957.



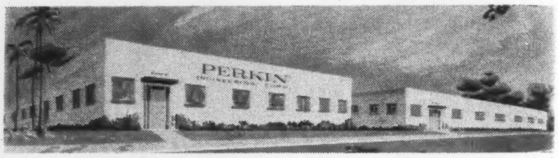
HELIPOT DIV., BECKMAN INSTRUMENTS, INC., announces completion of its move from S. Pasadena to temporary quarters in Costa Mesa until their new $2 million Newport Beach plant is ready.

GENERAL ELECTRIC CO. announces merging of its industrial computer sales force into a national organization with headquarters in Syracuse, N. Y.—GE's Advanced Electronics Center at Cornell Univ. will become a part of the Light Military Electronic Equipment Dept. at Utica, N. Y.

ALLEN B. DU MONT LABS., INC., announces a new TV-Transmitter Dept. to concentrate on electronic scanning systems and industrial television.

CONTINENTAL CARBON, CLEVELAND, announces the procurement of the Wirt Co., Philadelphia, by Continental's directors.

PERKIN ENGINEERING CORP., El Segundo, Calif., announces acquisition of a new building adjacent to thei present location for production of power supplies an voltage regulators.



DAYSTROM, INC., announces formation of Daystrom Systems Div. to design, build, test and install complete systems for automation applications.

AMERICAN MACHINE & FOUNDRY CO., Turbo Div., recently dedicated a new 66,000 sq ft advanced research and development center at Pacoima, Calif.

MINNEAPOLIS-HONEYWELL REGULATOR CO. announces purchase of the Hathaway plant in Boston t house Honeywell's Transistor Div., and plans to erect a

COMPUTING ENGINEERS APPLIED MATHEMATICIANS
(All Levels)

New Opportunities in Republic Aviation's Expanding Computer Program

A new, air-conditioned installation is under construction at Republic to house the equipment and personnel of its rapidly expanding Digital Computing Section.

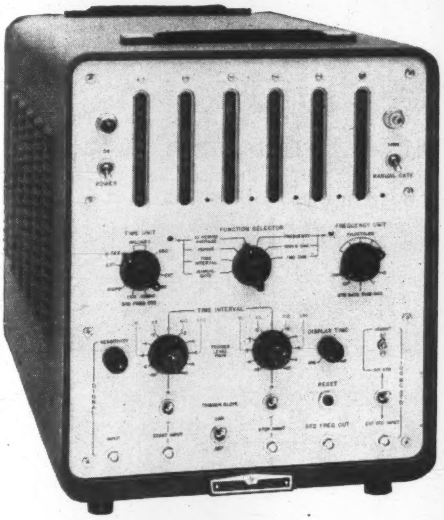
Enjoy the opportunities that go with a wide range of complex problems in the design and manufacture of supersonic aircraft and guided missiles as we plan the progressive expansion of this installation in 3 phases. Positions are open at various levels, including supervisory.

You can capitalize on these opportunities if you have at least 2 years experience programming for digital computers, along with a sound background in mathematics — opportunities to enjoy varying degrees of responsibility where your knowledge of digital computing equipment, mathematical procedures and numerical techniques can be utilized for maximum efficiency.

Please send resume in confidence to: **Mr. D. G. Reid**
Engineering Personnel Manager
REPUBLIC AVIATION
Farmingdale, L. I., New York

Direct readings of

FREQUENCY
TIME
PERIOD



New hp 523B
ELECTRONIC COUNTER

10 cps to 1.1 MC!

- **Extreme dependability**
- **Etched, unitized circuits**
- **Permits viewing time-interval start and stop points on oscilloscope**
- **High accuracy crystal oscillator circuit**
- **Trouble-localizer lights**
- **Counts pulses of selected voltage level**

Construction of the new *-hp-* 523B is highest quality throughout. Etched circuits are rugged, ultra-dependable. Circuits are arranged for complete visibility. Trouble-localizer lights and plugs disconnecting circuit elements further simplify maintenance.

Exclusive features include a pulse output for oscilloscope Z-axis modulation permitting visual identification of the time-interval start and stop points on the input waveform measured. There is also a pulse count discriminator counting only pulses of voltage above a pre-determined level; and a high accuracy, high stability crystal controlled oscillator. Controls are color-coded, concentric, functionally arranged. Readings are direct in clear, bright numerals; decimal is automatic and illuminated.

The broad range and versatile usefulness of *-hp-* 523B is indicated by the Specifications at right. Model 523B is designed for utmost speed and simplicity in measuring production quantities, rpm, nuclear pulses, power line frequencies, repetition rates, time intervals, pulse lengths, shutter speeds, velocities, relay times, frequency ratios, phase delay, etc. With transducers, *-hp-* 523B also provides local or remote measurement of weight, pressure, temperature, acceleration, etc.

BRIEF SPECIFICATIONS

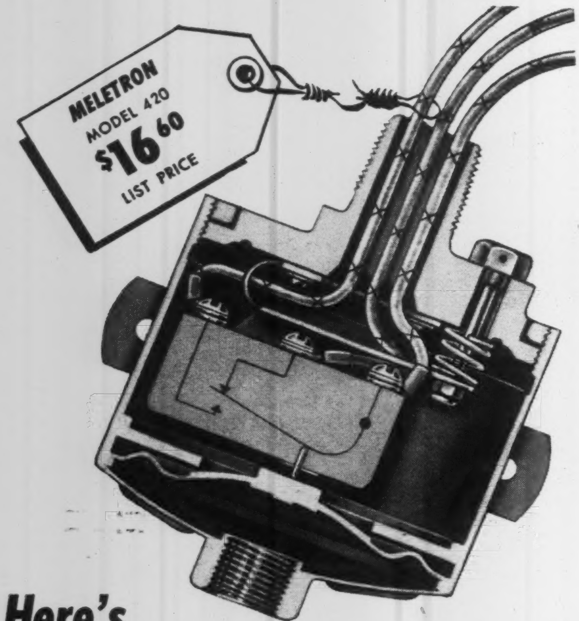
FREQUENCY MEASUREMENT:	
Range:	10 cps to 1.1 MC
Accuracy:	± 1 count ± crystal stability
Input Minimum:	0.2 v RMS
Input Impedance:	Approx. 1 megohm, 30 μμf shunt
Gate Time:	0.001, 0.01, 0.1, 1, 10 seconds
Reads Directly In:	KC. Automatic decimal
PERIOD MEASUREMENT:	
Range:	0.00001 cps to 10 KC
Accuracy:	±0.3% (1 period); ±0.03% (10 periods)
Input Minimum:	1 v RMS
Input Impedance:	Approx. 1 megohm, 40 μμf shunt
Gate Time:	1 or 10 cycles of unknown
Standard Counting:	10 cps, 1 KC, 100 KC, 1 MC, External
Reads Directly In:	Sec, msec, μsec; automatic decimal
TIME INTERVAL MEASUREMENT:	
Range:	3.0 μsec to 100,000 sec (27.8 hrs)
Accuracy:	±1/ std. freq. counted ± stability
Input Minimum:	1 v peak. dc coupled
Input Impedance:	Approx. 1 megohm, 25 μμf shunt
Trigger Slope:	Pos. or neg. on start/stop independent or common channels
Trigger Amplitude:	−300 to +300 v adjustable
Standard Counting:	10 cps, 1 KC, 100 KC, 1 MC, External
Reads Directly In:	Sec, msec, μsec, automatic decimal
STABILITY:	2/1,000,000 per week. Also WWV
DISPLAY TIME:	Variable 0.1 to 5 sec, or indefinite
OUTPUTS:	Secondary standard: 10 cps, 1 KC rectangular, 100 KC, 1 MC sine wave.
PRICE:	$1,175.00

Data subject to change without notice. Price f.o.b. factory.

HEWLETT-PACKARD COMPANY
3695C Page Mill Road, Palo Alto, California, U.S.A.
Cable "HEWPACK" DAvenport 5-4451
Field engineers in all principal areas

complete coverage in quality counters

For more information circle **33** on inquiry card.



Here's the Simplest Diaphragm Pressure Switch

WE BUILD IN	WE DON'T USE
EXTREME ACCURACY and DEPENDABILITY maintained during operating life due to direct acting design	**LINKAGES & BEARINGS** which, as they wear, make the setting of the pressure switch drift.
OPERATION IN ANY POSITION which saves the installation costs encountered in mounting a switch that uses liquid switching elements.	**LIQUID SWITCHING ELEMENTS** which make the switch difficult to mount and very critical to vibration.
IMMUNITY TO VIBRATION you can mount the switch directly on your vibrating or moving equipment.	**ACCORDION DIAPHRAGMS** which make the pressure switch sensitive to vibration.

To get complete specifications and operating data ask for bulletins 420-421

BARKSDALE VALVES

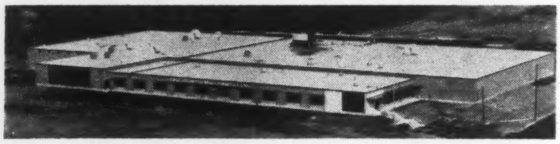
PRESSURE SWITCH DIVISION
5125 Alcoa Avenue, Los Angeles 58, California

For more information circle 34 on inquiry card.

PLANTS—CONTINUED

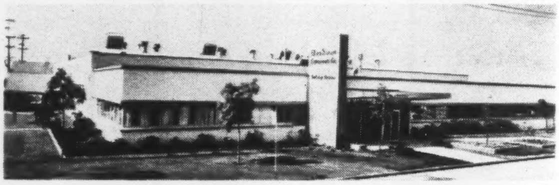
$4-million plant near St. Petersburg, Fla., to develop and produce inertial-guidance navigation equipment.

BALDWIN-LIMA-HAMILTON CORP. has opened a new $3 million plant at Waltham, Mass., to house its entire Electronics Instrumentation Div. under one roof.



AUTOMATIC ELECTRIC CO., CHICAGO, announces revised estimates of expected demand for their dial telephones and other electronic products has prompted an increase of 200,000 sq ft in their new manufacturing and research center now under construction.

BERKELEY DIV., Beckman Instruments, has completed the $500,000 building program initiated last October which doubles the size of the Richmond, Calif. facilities.



What's the latest in

PROCESS AUTOMATION?

You can learn about . . .

COC (Centralized Operations Control) techniques, with demonstrations of systems built up from COC subsystem elements.

Presented by Hammarlund Manufacturing Company, in Room 551

Control applications of "Dynamaster" high-speed potentiometer equipment.

Presented by The Bristol Company, in Room 301

Automatic control systems for process variables, including load, pressure, torque, etc.

Presented by Baldwin-Lima-Hamilton Corp., in Room 542

"Rotameter" flow measurement and control.

Presented by Brooks Rotameter Company, in Room 532

Equipment applications and techniques used in automatic data logging—and appraisal of promising future developments.

Presented by Fischer & Porter Company, in Rooms 430, 444

Installation and operation of centralized control of integrated, remote, field operations.

Presented by Panellit, Inc., in Rooms 529, 530

Selection and application criteria for pressure switches.

Presented by Gorn Electric Co., Inc. in Room 544

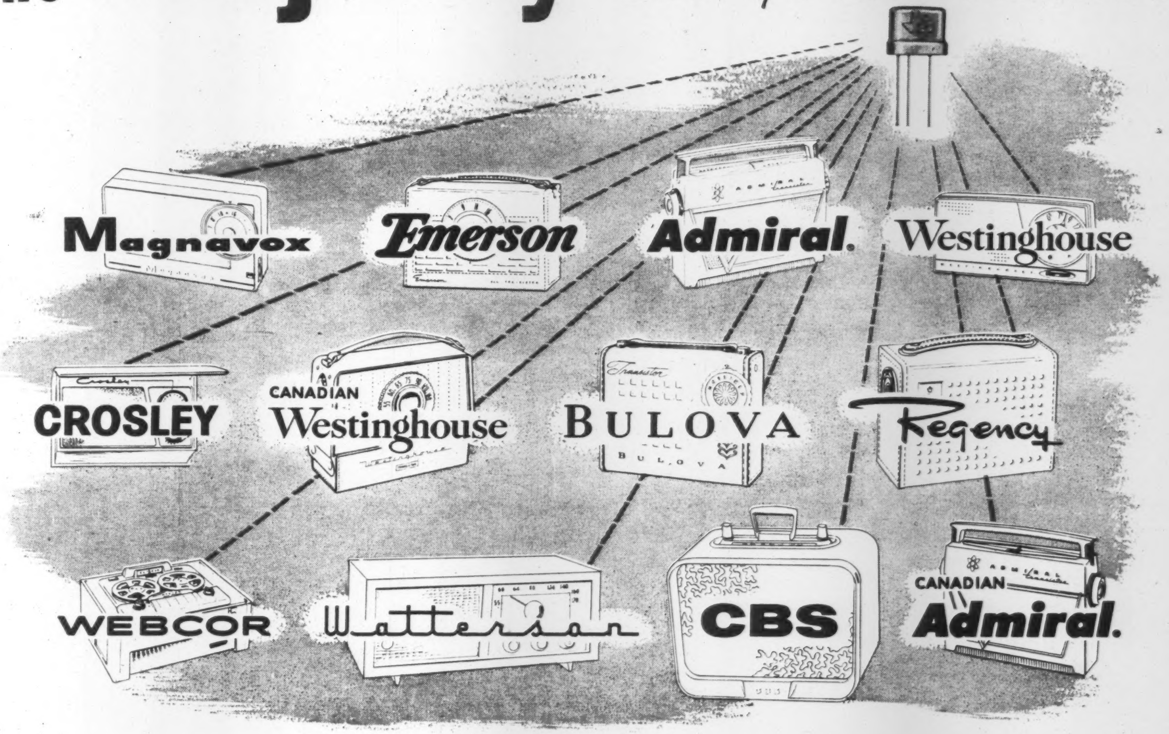
Investigation of valve system performance factors, e.g. capacity, erosion, tight shut-off, and high-speed operation; with description of Paul Venturi Ball Control Valve.

Presented by P-K Industries, Inc., in Room 526

at the **PROCESS AUTOMATION CLINIC** at the Third International Automation Exposition. See page 1970 for registration coupon.

TI PROGRESS REPORT ON RADIO TRANSISTORIZATION

the majority use T/I transistors!



The overwhelming majority of transistorized radios—including these and other brands—use Texas Instruments transistors. This is simple proof of TI's leadership in research, development, and manufacture of transistors.

The constantly growing line of economical TI transistors—high in gain, frequency, power, and reliability—offers *your* transistorization program increasing design freedom and flexibility.

ALL THESE UNITS ARE IN PRODUCTION AND IMMEDIATELY AVAILABLE!

VHF GERMANIUM TETRODE—Maximum oscillation frequency above 250 mc; typical amplifier gain, 12 db at 100 mc. A "grown-diffused" product!

GERMANIUM POWER TRANSISTOR—For Class A and B amplifiers; low distortion, linear beta, high current capacity.

GERMANIUM HF TRANSISTOR—Converter in 455 kc commercial receivers; conversion gain, 22 db minimum at 1800 kc input.

GERMANIUM AUDIO OUTPUT TRANSISTOR—Designed for driver and Class B audio applications; low distortion, linear beta.

GERMANIUM IF AMPLIFIER TRANSISTORS—High gain in common emitter applications. In 262 kc and 455 kc types; all with fixed value of neutralizing impedance.

GENERAL PURPOSE GERMANIUM TRANSISTORS—Three types for general application; featuring narrow beta spread.

LOOK TO TI FOR: GERMANIUM VHF, POWER, RADIO, AND GENERAL PURPOSE TRANSISTORS
SILICON HF, POWER, AND SMALL SIGNAL TRANSISTORS • SILICON DIODES AND RECTIFIERS

pioneer producer of radio transistors!

TEXAS INSTRUMENTS
INCORPORATED
6000 LEMMON AVENUE DALLAS 9, TEXAS

For more information circle **35** on inquiry card.

CONSOLIDATED ELECTRODYNAMICS CORP. announces appointment of *Holley B. Dickinson* as assistant to the president.

H. B. Dickinson
CEC

L. L. Forward
Taylor

TAYLOR INSTRUMENT COS. announce appointments of *L. Lawrence Forward* as general sales manager, and *Albert J. Fleig* as assistant sales manager. Present general sales manager *Frank S. Ward* is named administrative assistant to the president.

TECHNICAL WRITING IMPROVEMENT SOCIETY, Los Angeles, Calif., announces election of *John L. Kent,* chief of the Editorial Bureau of Consolidated Electrodynamics Corp., as president.

SERVOMECHANISMS, INC., announces appointment of *Najeeb E. Halaby* as vp in charge of company development, and *Thurman C. Erickson* as industrial relations director.

Edward M. Bieber

EDWARD M. BIEBER, vice-president, American Laubscher Corporation, died on Wednesday, August 15, 1956.

People IN THE NEWS

BARBER-COLMAN CO. announces appointment of *H. H. Kieckhefer* as sales manager of Wheelco Instruments Div.

H. H. Kieckhefer
Barber-Colman

O. B. Wilson
M-H

MINNEAPOLIS-HONEYWELL REGULATOR CO. announces appointment of *O. B. Wilson* as VP, Brown Instruments Div.

BURROUGHS CORP. has named *Dr. Irven Travis* vp of research and engineering, and *U. Clarke S. Dilks* manager, Research Div.

CLIFTON PRECISION PRODUCTS CO., INC., announces appointment of *H. Thomas Larkins* as eastern sales manager.

DRILL MICRO-HOLES
DOWN TO .0016"
with SPEED & ACCURACY

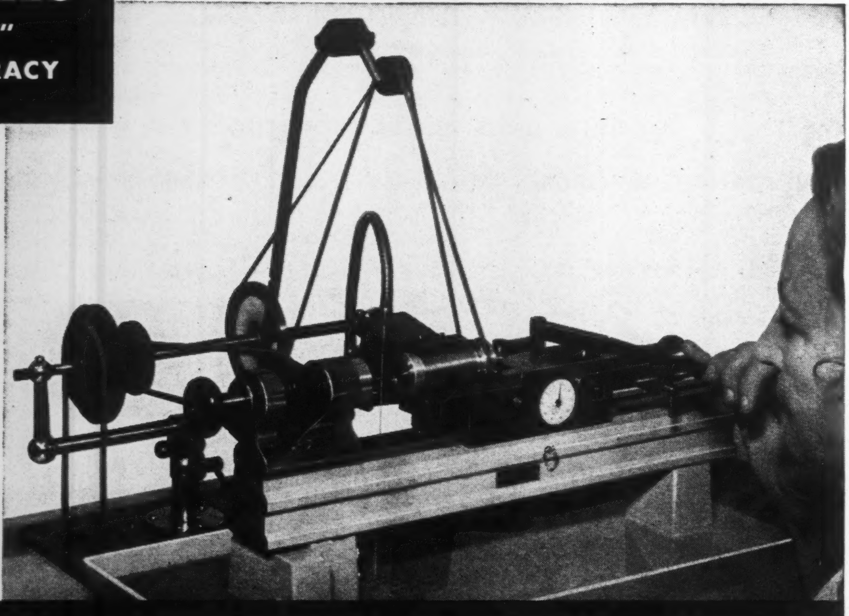
ON LEVIN ® INSTRUMENT LATHES

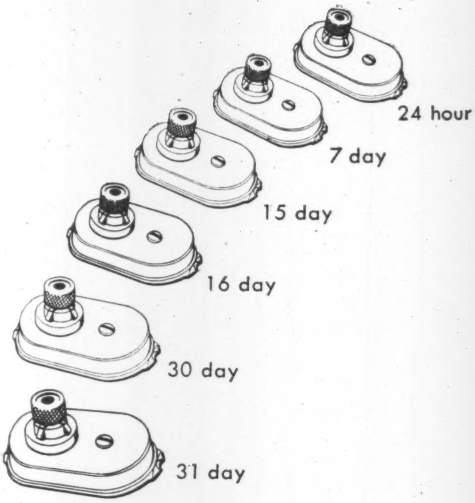
The Levin micro-drilling equipment shown here can be used with the smallest drills available. It is designed so that the drilling does not depend on the operator's sense of feel. The drill can be retracted for chip removal and returned to the drilling position without striking the bottom of the hole. While commercial drills can be had as small as .0016" this micro-drilling apparatus has successfully produced holes as small as .0006".

Send for Catalog M describing complete line of instrument lathes and accessories.

LOUIS LEVIN & SON, INC.—3610 S. BROADWAY—LOS ANGELES 7, CALIFORNIA

For more information circle **36** on inquiry card.




24 hour
7 day
15 day
16 day
30 day
31 day

New ROCKWELL

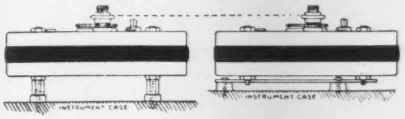
31 DAY CHART DRIVE

For Complete Records Around The Clock

The turret on top does the trick

Stops Estimating Even though your meter man forgets to wind it, this new Rockwell 31 day drive will still provide a complete rotation for the chart period.

Saves Money The six different rotation rates (as illustrated) assure complete flexibility in your measurement program. You'll save through making less trips to the meter; having fewer charts to read.


INSTRUMENT CASE
INSTRUMENT CASE

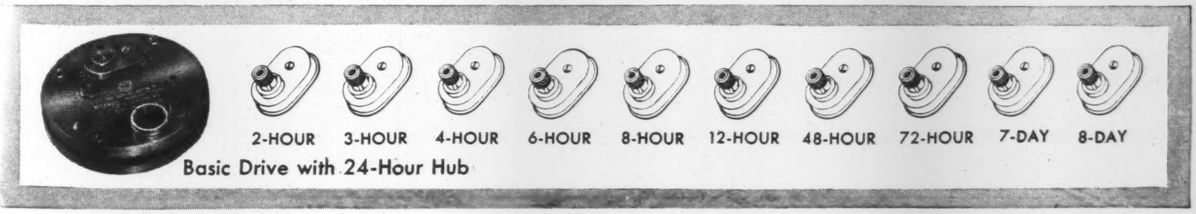
Fits Practically All Instruments The case dimensions are the same as the Rockwell Standard Chart Drive. Simple adaptors, as shown above, permit correctly locating it both as to position and height in practically any instrument.

ROCKWELL MANUFACTURING COMPANY

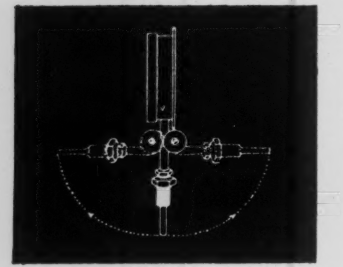
Instrument Division • Box 2396, Tulsa, Okla.

Atlanta Boston Charlotte Chicago Dallas Denver Houston Los Angeles
Midland, Tex. New Orleans New York N. Kansas City Philadelphia Pittsburgh
San Francisco Seattle Shreveport Tulsa

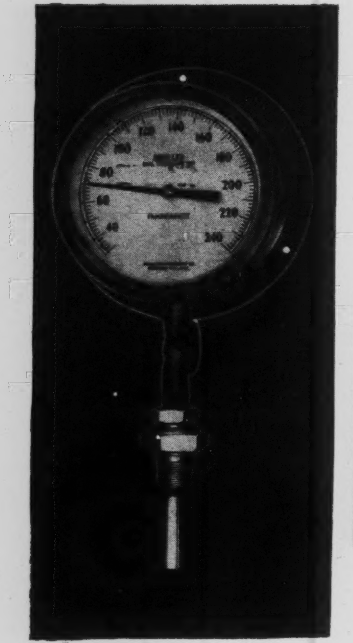
ALSO STANDARD ROCKWELL CHART DRIVES, 24 Hour Hub, 11 Rotations

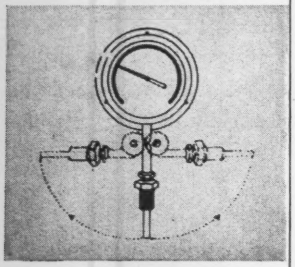

2-HOUR
3-HOUR
4-HOUR
6-HOUR
8-HOUR
12-HOUR
48-HOUR
72-HOUR
7-DAY
8-DAY
Basic Drive with 24-Hour Hub

For more information circle **37** on inquiry card.



You get dependability **PLUS** with Moeller dial indicating *(mercury actuated)* thermometers





because—since 1867 our business has been the design and manufacture of temperature measuring instruments.

Up or down—left or right, you can easily install Moeller adjustable form dial indicating thermometers at any advantageous reading angle.

For further details, mail the coupon, today!

MOELLER
INSTRUMENT COMPANY
132nd ST. and 89th AVE.
RICHMOND HILL 18, N. Y.
Representatives in Principal Cities

Gentlemen: Without obligation, please send me Moeller Catalog No. 150 on Dial Indicating Thermometers.

NAME ....
FIRM ....
ADDRESS ....
CITY .... ZONE.......... STATE..................

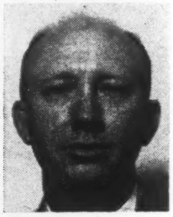
For more information circle **38** on inquiry card.

FAIRCHILD CAMERA AND INSTRUMENT CORP. announces appointment of *Raul H. Frye* as general manager of the Electronics Division.

BRUSH ELECTRONICS CO. announces appointment of *Joseph Foster* as manager, market research dept.

EPSCO, Inc., announces appointment of *Arthur L. Munzig, Jr.*, as sales manager.

A. L. Munzig, Jr.
Epsco



L. P. Skinner
Process Sales

PROCESS SALES CO., Beaumont, Texas, has been formed recently by *L. P. Skinner, Jr.*, as an engineering and sales agency for manufacturers of industrial instrumentation and chemical process equipment.

NATIONAL BUREAU OF STANDARDS—*Harvey W. Lance* has rejoined the NBS staff as chief of the calibration center at NBS Boulder Labs.

FISHER GOVERNOR COMPANY has named *Jack M. Smither & Co.* sales representative for Georgia, Fla., and eastern Tennessee.

What's new in
OFFICE AUTOMATION AND DATA-HANDLING?
You can learn about . . .

Large-scale office procedures and systems implemented by automatic data processing machines.
Presented by Remington Rand Div., Sperry Rand Corp., in Rooms 534, 537

Special-purpose "Magnetronic" systems for automatic banking, automatic reservation handling, automatic stock exchanges, automatic inventory, etc.
Presented by Teleregister Corporation, in Room 436

Large-scale data handling for industry and finance, including point-of-action data pick-up and media transfer systems.
Presented by Underwood Corporation, in Room 429

Applications for semi-automatic and fully automatic pneumatic tube systems for transferring data and documents, including demonstrations of operating systems.
Presented by International Standard Trading Corporation, in Room 527

Ormig selective data printers, which break down data from lists and print on single-item tickets, also select and print lines, columns, headings.
Presented by Copy-Craft, Inc., in Room 327

Digital data recording and handling, including a new random-access memory of high capacity for business applications.
Presented by Potter Instrument Company, Inc., in Room 549

Central control systems with automatic data handling, including programming, logging, etc. Emphasis on process data.
Presented by Fischer & Porter Company, in Rooms 430, 444

Automatic data logging and control centers for industrial operations.
Presented by Panellit, Inc., in Rooms 529, 530

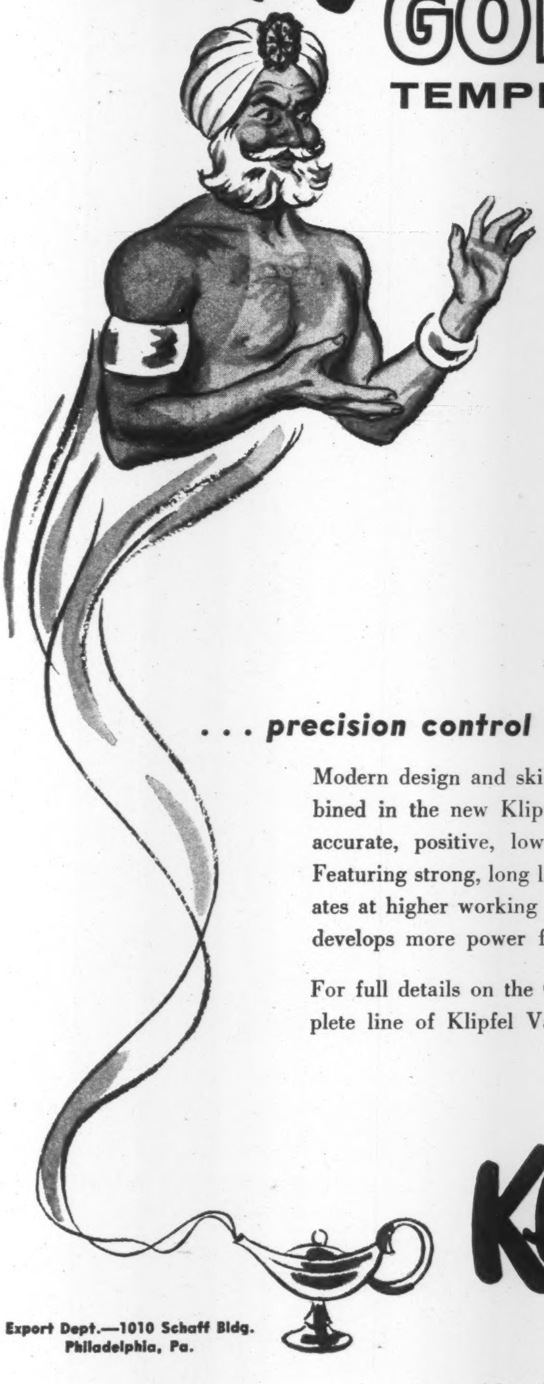
Statistical Analysis.
Presented by Electronic Control Systems, Inc., in Room 507

at the **OFFICE AUTOMATION and DATA-HANDLING CLINIC** at the Third Automation Exposition. See page 1970 for registration coupon.

Klipfel

GOLDEN GENIE

TEMPERATURE REGULATOR

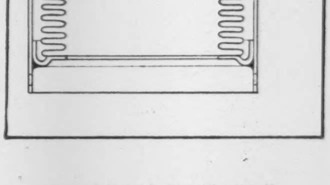


- Self-actuated
- Vapor Pressure Type
- Emergency manual control override
- Accurate temperature adjustment

. . . precision control at your command

Modern design and skilled craftsmanship are combined in the new Klipfel Golden Genie to assure accurate, positive, low cost temperature control. Featuring strong, long lasting 2-ply bellows, it operates at higher working pressure with smaller bulb, develops more power for valve actuation.

For full details on the Golden Genie and the complete line of Klipfel Valves, write to Dept. D-10.

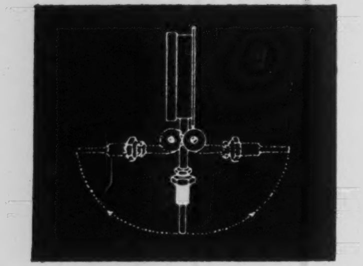


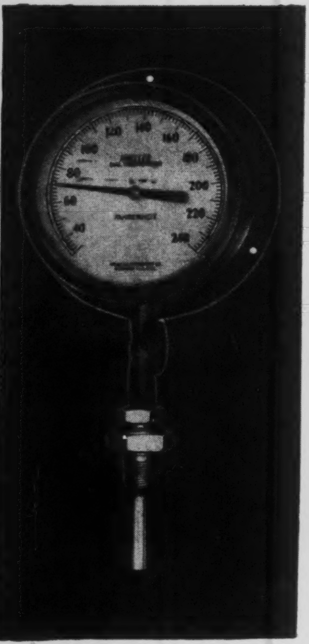
Rugged 2-ply Double Wall Bellows . . . Vapor pressure cup construction gives added strength. Cannot be over-extended. High pressure small bulb operation develops more power.

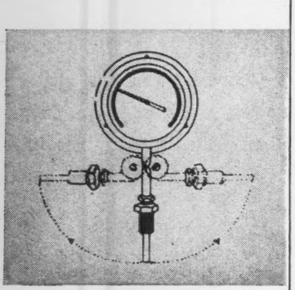
Klipfel VALVES, INC.
Division of Hamilton-Thomas Corp.
Hamilton, Ohio

Export Dept.—1010 Schaff Bldg.
Philadelphia, Pa.

For more information circle **39** on inquiry card.







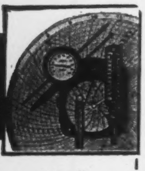
You get dependability PLUS with Moeller dial indicating (mercury actuated) thermometers

because—since 1867 our business has been the design and manufacture of temperature measuring instruments.

Up or down—left or right, you can easily install Moeller adjustable form dial indicating thermometers at any advantageous reading angle.

For further details, mail the coupon, today!

MOELLER INSTRUMENT COMPANY
132nd ST. and 89th AVE.
RICHMOND HILL 18, N. Y.
Representatives in Principal Cities



Gentlemen: Without obligation, please send me Moeller Catalog No. 150 on Dial Indicating Thermometers.

NAME ....
FIRM ....
ADDRESS ....
CITY .... ZONE .... STATE ....

For more information circle **38** on inquiry card.

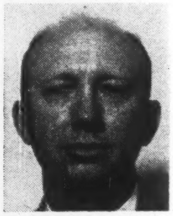
PEOPLE—CONTINUED

FAIRCHILD CAMERA AND INSTRUMENT CORP. announces appointment of *Raul H. Frye* as general manager of the Electronics Division.

BRUSH ELECTRONICS CO. announces appointment of *Joseph Foster* as manager, market research dept.

EPSCO, Inc., announces appointment of *Arthur L. Munzig, Jr.*, as sales manager.

A. L. Munzig, Jr.
Epsco



L. P. Skinner
Process Sales

PROCESS SALES CO., Beaumont, Texas, has been formed recently by *L. P. Skinner, Jr.*, as an engineering and sales agency for manufacturers of industrial instrumentation and chemical process equipment.

NATIONAL BUREAU OF STANDARDS—*Harvey W. Lance* has rejoined the NBS staff as chief of the calibration center at NBS Boulder Labs.

FISHER GOVERNOR COMPANY has named *Jack M. Smither & Co.* sales representative for Georgia, Fla., and eastern Tennessee.

What's new in

OFFICE AUTOMATION AND DATA-HANDLING?

You can learn about . . .

Large-scale office procedures and systems implemented by automatic data processing machines.
Presented by Remington Rand Div., Sperry Rand Corp., in Rooms 534, 537

Special-purpose "Magnetronic" systems for automatic banking, automatic reservation handling, automatic stock exchanges, automatic inventory, etc.
Presented by Teleregister Corporation, in Room 436

Large-scale data handling for industry and finance, including point-of-action data pick-up and media transfer systems.
Presented by Underwood Corporation, in Room 429

Applications for semi-automatic and fully automatic pneumatic tube systems for transferring data and documents, including demonstrations of operating systems.
Presented by International Standard Trading Corporation, in Room 527

Ormig selective data printers, which break down data from lists and print on single-item tickets, also select and print lines, columns, headings.
Presented by Copy-Craft, Inc., in Room 327

Digital data recording and handling, including a new random-access memory of high capacity for business applications.
Presented by Potter Instrument Company, Inc., in Room 549

Central control systems with automatic data handling, including programming, logging, etc. Emphasis on process data.
Presented by Fischer & Porter Company, in Rooms 430, 444

Automatic data logging and control centers for industrial operations.
Presented by Panellit, Inc., in Rooms 529, 530

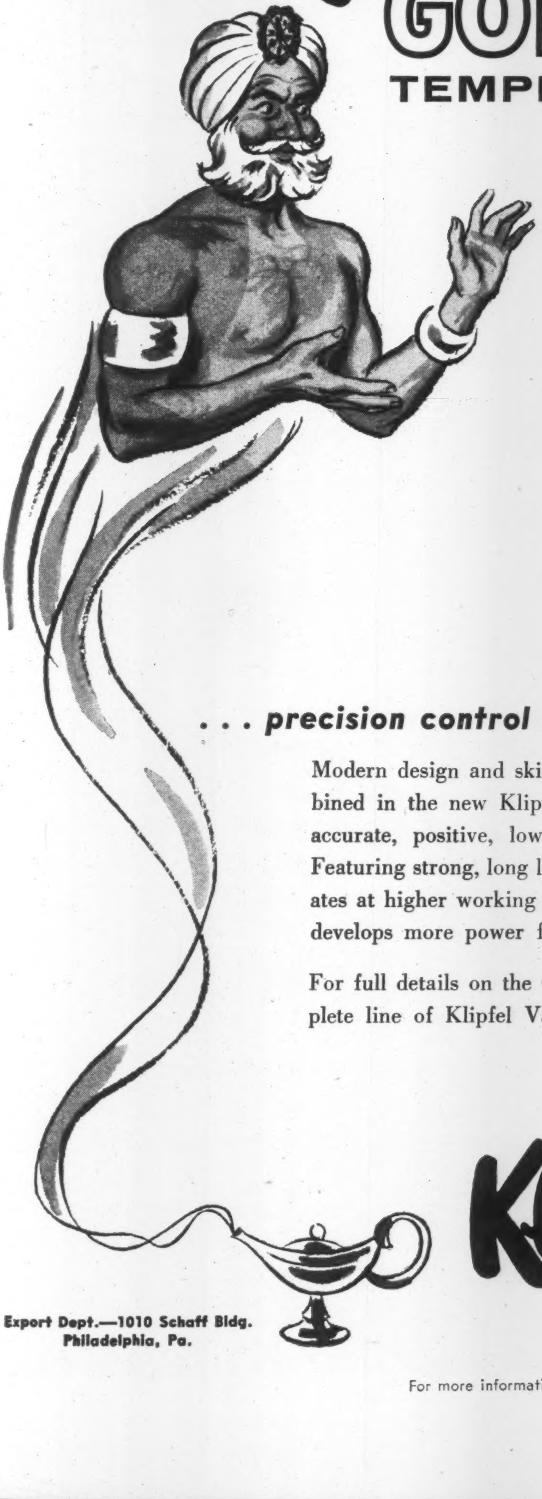
Statistical Analysis.
Presented by Electronic Control Systems, Inc., in Room 507

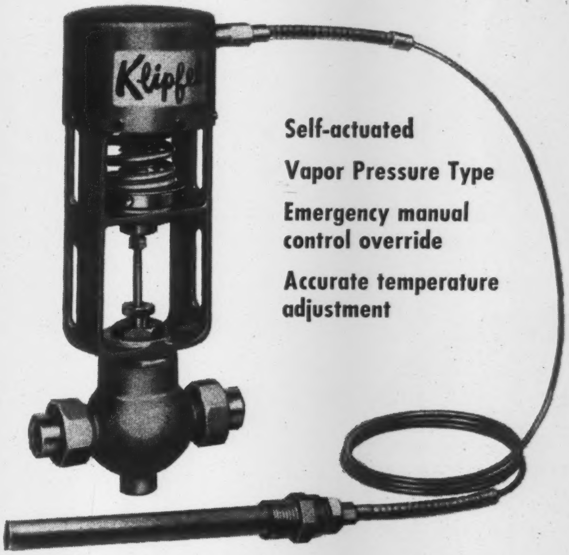
at the **OFFICE AUTOMATION and DATA-HANDLING CLINIC** at the Third Automation Exposition. See page 1970 for registration coupon.

Klipfel

GOLDEN GENIE

TEMPERATURE REGULATOR





Self-actuated

Vapor Pressure Type

Emergency manual control override

Accurate temperature adjustment

. . . precision control at your command

Modern design and skilled craftsmanship are combined in the new Klipfel Golden Genie to assure accurate, positive, low cost temperature control. Featuring strong, long lasting 2-ply bellows, it operates at higher working pressure with smaller bulb, develops more power for valve actuation.

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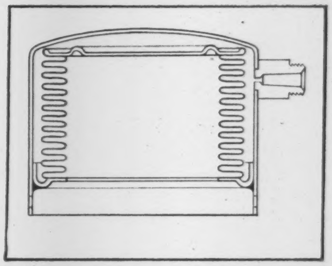

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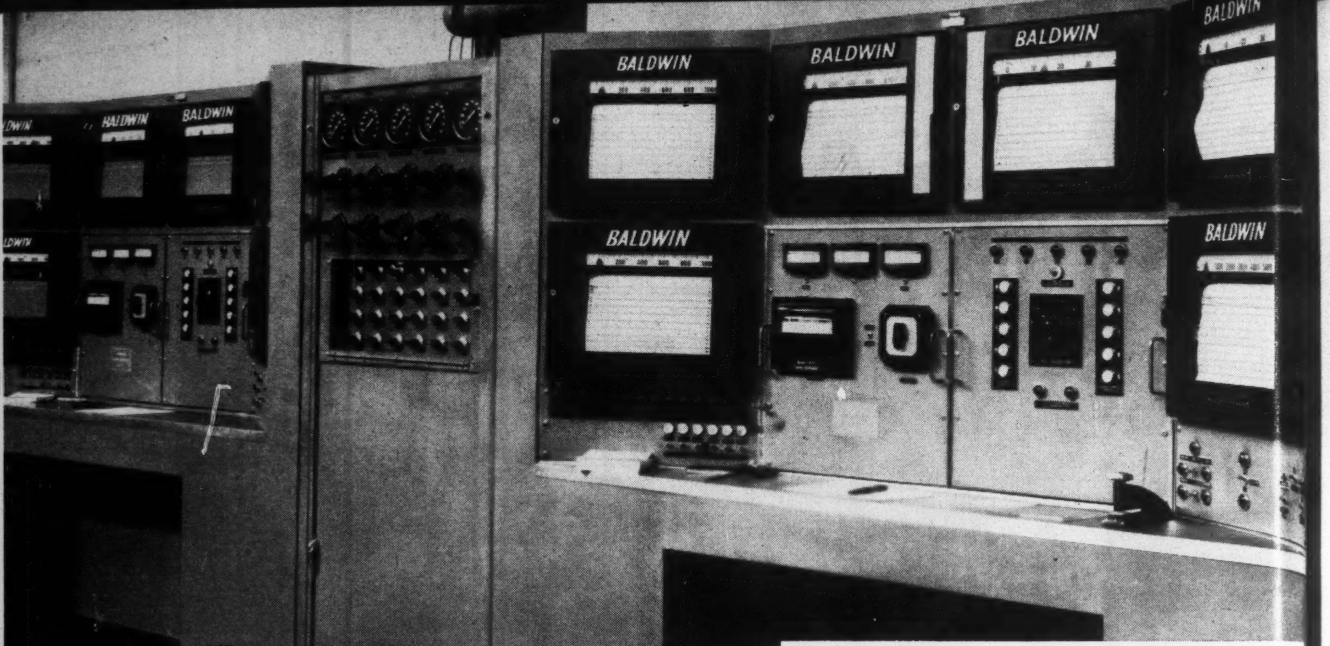
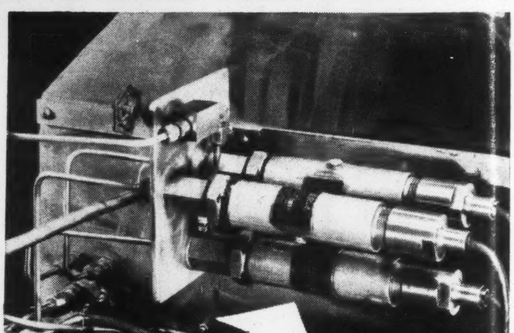




jet engine starter performance plotted quickly and accurately by Baldwin SR-4® system

Under simulated operating conditions, turbine type fuel-air combustion starters for jet aircraft engines are performance-tested by a Baldwin instrumentation system that is instantaneously responsive and accurate to .1%.

Starter operating characteristics are measured by three Baldwin SR-4 strain gage type pressure cells (at top of photo at right) and an SR-4 torque pickup (below) which follow variations in combustion pressure, fuel pressure, air pressure and torque. Electrical signals are transmitted from the cells and plotted on Baldwin recorders mounted in control consoles (photo above). Also plotted are primary ignition voltage and shaft speed, With this instrumentation system one test engineer can conduct 3½ second test runs on a continuous basis.

If *you* need to measure torque, pressure, load, tension or thrust, Baldwin can custom-design and build a system to do the job. "Packaged" systems and component transducers are also available. For illustrated bulletins, write us at Dept. 3153, Waltham, Massachusetts.

SEE OUR EXHIBIT AT THE AUTOMATION SHOW

BALDWIN
BLH
LIMA-HAMILTON

ELECTRONICS & INSTRUMENTATION DIVISION
BALDWIN-LIMA-HAMILTON

DIVISIONS: Austin-Western • Eddystone • Hamilton • Lima •
Loewy-Hydropress • Madsen • Pelton • Standard Steel Works

For more information circle **40** on inquiry card.

Inquiries

These inquiries, representing problems facing readers of **Instruments & Automation**, are published as a free service to our readers.

Sales Volume of Planimeters

Reader is trying to establish figures of the annual sales volume of planimeters in U.S. included in the Census of Manufacturers factory shipments under "Surveying and Drafting Instruments." A-144

Identity of Pyrometer

Engineer in fuel burning equipment and controls manufacturing company would like to identify pyrometer marked "K & S, Made in Germany." Pyrometer has 2¼" dia, is 6" long, and has pointer to be set at room temperature which gives reading on scale after training eyepiece on fire. A-145

Load Cells

Engineer in paper machinery manufacturing plant seeks addresses of manufacturers of load cells. A-146

Shaft Speed Indication

Engineer in rayon manufacturing plant seeks mechanical differential unit for indication of input shaft speeds without power transmission. Unit not larger than 4"x4"x4" is desired. Shaft speeds approximately 230 RPM. A-147

Nylon Stock Gears

President of scientific instrument company seeks names of companies stocking nylon gears particularly worm gears. A-148

Noisemeter

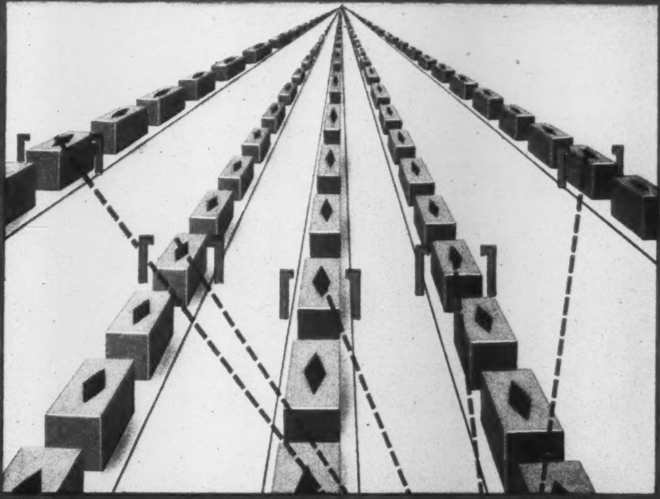
Engineer in pump manufacturing plant seeks noisemeter to detect noise in pipelines caused by pumps. A-149

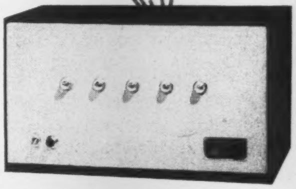
Micron Particle Separator

Jewelry manufacturer seeks supplier of micron particle separator. A-150

Telemetering Pickups—Terminology

Engineering department member of manufacturer of pressure transducers seeks information on standard terminology for specifying pressure pickups, in particular the definition of percent non-linearity of a pickup. A-151





MULTI PRODUCTION LINES NEED:

POST multi-channel counters

New . . . Post's multi-channel counters answer industry's need for a "total" count from several production lines *at any given moment.* Working in conjunction with a Post DECITRON electronic counter, the multi-channel system requires a photohead for each production line . . . relayed signals are tabulated by the MC and transferred to the counter instantly for visual evidence of "total".

MC—MULTI CHANNEL INPUT UNIT

Post also manufacture a variety of photo electric relays and industrial timers ideally suited to multi-production control systems. Write for descriptive literature.

POST

Electronic Products Division

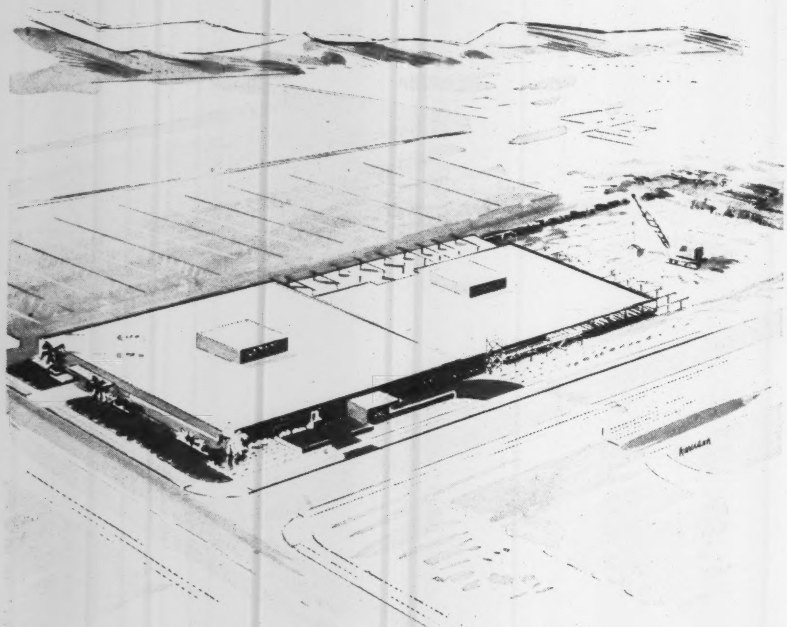
POST MACHINERY CO.
163 Elliott Street
Beverly, Mass.

For more information circle **41** on inquiry card.

ElectroData

IS EXPANDING...

Headquarter facilities in Pasadena are *again* being doubled to keep pace with the demand for DATATRON systems.



ElectroData is the fastest growing manufacturer of electronic data processing machines, and has immediate openings for:

CUSTOMER SERVICE ENGINEERS
SYSTEM EVALUATION ENGINEERS

Desirable qualifications are a degree in electrical engineering or graduate of an accredited industrial electronics school. Military radar experience or maintenance of digital computers or complex electronic equipment may be substituted for academic training.

Customer Service Engineers will be in charge of an ElectroData data processing installation. These positions exist nation-wide.

Systems Evaluation Engineers will supervise an engineering team in the final checkout and evaluation of digital computer systems.

ElectroData policy is to pay *top salaries* to men of proven capabilities. Company benefits are liberal and include:

- **Comprehensive Insurance and Retirement Program.**
- **Personal recognition.**
- **Extensive training program.**
- **Relocation expense.**
- **Salary and expense during training.**

In confidence write:

MR. LEO THOMAS
Engineering Coordinator

ElectroData DIVISION OF BURROUGHS
460 SIERRA MADRE VILLA, PASADENA, CALIFORNIA

INQUIRIES—CONT.

Neon Lamps for Computers

Consultant for company furnishing electric protection services seeks information on long-life neon lamp types used in the computer industry as storage devices. A-152

Name Plates

Vice president of pulp and paper manufacturing company seeks names and addresses of "printers who specialize in printing for various types of panels and controls." A-153

Correspondence Course

Engineer in Canadian power station seeks correspondence course in automation and electronics. A-154

Instrumentation Books and Courses

Engineer in test department of development and engineering company wishes to get information on books and educational courses on instrumentation methods, setups, repair, calibration, and the like. A-155

Portable Acceleration Recorder

Chief test engineer of aircraft company seeks portable self-contained recording accelerometer to be enclosed in containers when shipping cross country. A-156

PRECISION GLASS APPARATUS
INDUSTRIAL GLASSWARE

INQUIRIES INVITED

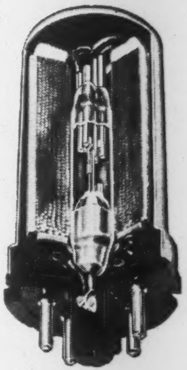
Send your BLUEPRINTS for our estimate on precision glass apparatus for research and control . . . made for your specific needs. Ground and graduated ware, thorough annealing. Hard, soft, lead or any grade glass desired.

L.G. NESTER
DEPT. B
COMPANY, INC.
MILLVILLE • NEW JERSEY

For more information circle **42** on inquiry card.

It will take still more years of testing —at 1.89×10^9 operations a year— to fix the life span of this relay

When we first claimed a life of a billion operations for CLARE *Mercury-wetted Contact Relays, we were guilty of a serious understatement.*



Here is the proof:

A life test was started in January, 1955. The relays on test are carrying a contact load of 5 amperes at 50 volts d-c (resistive load). A suitable spark suppressor is employed.

These relays have been operating continuously at a rate of 5,184,000 operations a day ever since, without any attention whatsoever.

As this is written they are closely approaching the 3 billion mark, with every indication they will go on operating for years.

Think of it! Here is a relay that in normal service will outlast a man's lifetime!

Have you a job for which none but the best relay is good enough? It can cost you much more to settle for less than this CLARE RELAY.

Price is reasonable. Prices for Multi-element Mercury-wetted Contact Relays have recently been reduced. Delivery is quick—a few days to a few weeks, depending on assembly desired and size of order.

FOR COMPLETE INFORMATION on CLARE Mercury-wetted Contact Relays for single or multiple circuits contact your nearest CLARE representative or address. C. P. CLARE & Co., 3101 Pratt Blvd., Chicago 45, Illinois. *In Canada:* C. P. CLARE & Co., 659 Bayview Avenue, Toronto 17. Cable address. CLARELAY.

Send for CLARE Sales Engineering Bulletins Nos. 120 and 122

CLARE RELAYS

FIRST in the industrial field

For more information circle **43** on inquiry card.

BIGGER THAN YOU THINK

Skinner solenoid valves are compact, tiny and lightweight. But don't be misled — they'll easily outperform other valves that are much larger and heavier. Built to withstand high voltages and temperature extremes, Skinner valves provide leakproof, trouble-free operation through millions of cycles. And being small, they are easily adaptable to your most compact equipment design. Call in a Skinner engineer on all your valve problems *first*. He can draw from over 100,000 variations . . . all of them *big in capacity, power and performance.*

Write for the new Skinner Solenoid Valve Catalog. On your letterhead, please.

SKINNER

SKINNER ELECTRIC VALVE DIVISION · SKINNER CHUCK COMPANY

SOLENOID VALVES

THE CREST OF QUALITY

SKINNER ELECTRIC VALVES ®

116 Edgewood Avenue
New Britain, Conn.

WORLD-WIDE REPRESENTATION

For more information circle **44** on inquiry card.

INSTRUMENTS and AUTOMATION Events

November 1-2

Eleventh annual meeting of the Society for Applied Spectroscopy, Hotel New Yorker, N. Y.

November 1-2

5th Annual Instrumentation Conference to be held on the campus of the Louisiana Polytechnic Inst., School of Engineering, Ruston, La.

November 7-8

6th Symposium & Instrument Fair "Automatic Data Processing Systems". Sponsored by Phila. Section of ISA, Bellevue-Stratford Hotel, Philadelphia, Pa. For information write Horace Richter, Symposium Chairman, Fischer and Porter Co., 29 Bala Ave., Bala-Cynwyd, Pa.

November 7-10

SAMA Laboratory Apparatus and Optical Sections midyear meeting, The Homestead, Hot Springs, Va.

November 8-9

Electronic Business Systems Conference, Sheraton-Palace Hotel, San Francisco, Calif.

November 14-16

Optics and Microwaves Symposium at the Lisner Auditorium, George Washington Univ., Washington, D. C. Sponsored by the I.R.E. Professional Group on Antennas and Propagation, The George Washington Univ. and the Optical Society of America.

November 15

Joint Meeting "Automation in the Future" Metropolitan Section, American Society of Mechanical Engineers and New York State Society of Professional Engineers, at Consolidated Edison Co. Auditorium, New York, N. Y. For information write H. Johnson, c/o Consolidated Edison Co., 4 Irving Place, New York 3, N. Y.

November 26-30

Third International Automation Exposition, New York Trade Show Building, 500 8th Ave., New York, N. Y. For information write Richard Rimbach Associates, 845 Ridge Ave., Pittsburgh 12, Pa.

December 5-7

Second IRE Instrumentation Conference & Exhibit, Biltmore Hotel, Atlanta, Ga. Sponsored by Professional Group on Instrumentation and the Atlanta Section of the IRE. For information write M. David Prince, Engineering Experiment Station, Georgia Inst. of Technology, Atlanta, Ga.

December 6-8

The first Southwide Chemical Conference sponsored by the Southeastern and Southwestern Regions of the American Chemical Society with the cooperation of the Memphis Section of the Instrument Society of America, Memphis, Tenn. For information write Southwide Chemical Conference, 2899 Jackson Ave., Memphis 8, Tenn.

January 14-15, 1957

3rd National Symposium on Realiability and Quality Control in Electronics. Sponsored by IRE Professional Group on Reliability and Quality Control, and the American Society for Quality Control and RETMA, Hotel Statler, Washington, D. C.

January 23-25

Symposium on "Theoretical and Experimental Results in the Propagation and Radiation of Very-Low-Frequency Electromagnetic Waves (less than about 100 kc), "NBS Boulder Labs., Boulder, Colo.

February 26-28

1957 Western Joint Computer Conference, Statler Hotel, Los Angeles, Calif.

March 11-14

The IRE Professional Group on Nuclear Science is cooperating with the EJC Second Annual Nuclear Science and Engineering Congress in Philadelphia. For information write Dr. Sidney Krasik, Editor, IRE—PGNS Transactions, 5621 Wilkins Ave., Pittsburgh 17, Pa.

April 11-13

Nine Southwestern I.R.E. Conference and Electronics Show, Shamrock Hotel, Houston, Texas.

April 29-May 1

Eighth Annual Symposium on Spectroscopy, Hotel LaSalle, Chicago, Ill.

May 22-24

11th Annual Convention and Exposition of the American Society for Quality Control, Masonic Temple, Detroit, Mich.

BAKER
"know how"
made it possible

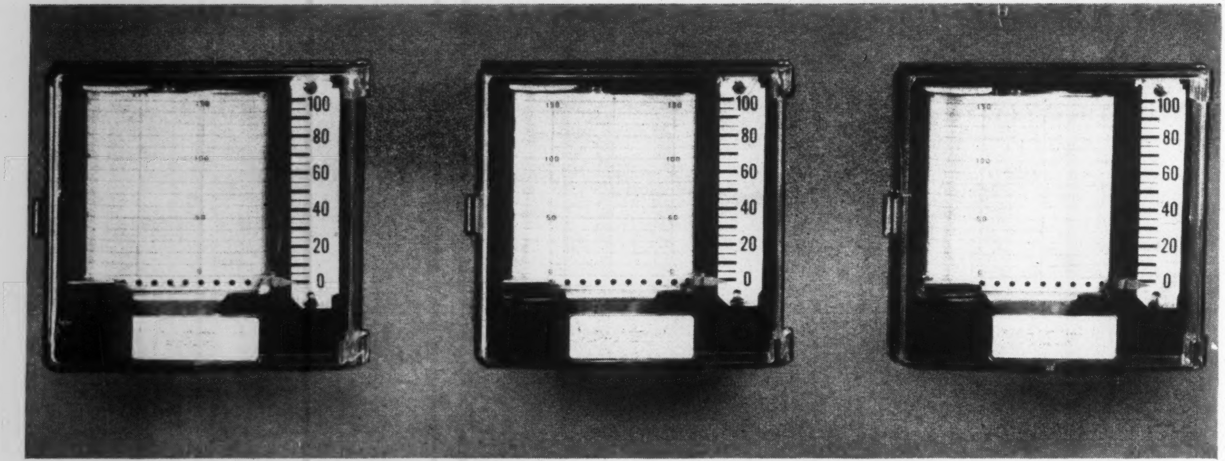
WIRE finer than .0004"
FOIL thinner than .0001"
RIBBON

Baker specializes in producing the fine wires, ribbons, strip and foils increasingly in demand for today's precise electronic instruments. Years of research and experimentation have developed the meticulous techniques and experience necessary for producing such wires in both ductile and non-ductile substances by the Wollaston, Taylor and extrusion methods.

For full information, send for our free booklet, "Fine Wire, Foils, Ribbons."

BAKER & COMPANY, INC. PRECIOUS METALS
113 ASTOR STREET, NEWARK 5, N. J.
NEW YORK • CHICAGO
SAN FRANCISCO • LOS ANGELES
ENGELHARD INDUSTRIES

For more information circle 45 on inquiry card.



BRISTOL'S® NEW MINIATURE ELECTRONIC RECORDERS take only 5" x 5⅛" panel space—can be mounted on 6½" centers. Size and external appearance completely match Bristol's pneumatic Metagraphic® instruments. Sixty-three-foot chart provides 31-day record at 1" per hour. Wide variety of chart speeds available with easily changed gears.

New! Compact Dynamaster electronic instruments

Full plug-in versatility, true servo-driven null-balance operation, high sensitivity are features of Bristol's new Series 663 Dynamaster recorders, indicators.

Now, for the first time, you can get all the inherent accuracy, stability and versatility of Bristol's electronic potentiometer and bridge instruments in a line of instruments designed for graphic panels and centralized recording and indicating of large numbers of variables.

The new Bristol 663 Series Dynamaster Recorders feature the same basic mechanism as full-sized Dynamaster instruments, completely redesigned and repackaged to carry out the basic graphic panel idea. They provide compact, centralized electronic recording, indication, and control of temperature, pressure, vacuum, pH, humidity, liquid level, speed, mechanical motion, smoke density, voltage, current, power, resistance, strain or any other variable that can be translated into an electrical quantity. Check these design features:

1. True motor-driven null-balance operation. Bridge, potentiometer or differential transformer types available. No delicate galvanometer movement, no moving coil, no pivots employed. Unaffected by severe vibration. Plenty of torque for operating control mechanism, retransmitting slidewires, alarm contacts, etc. with full accuracy.

2. Reads directly from sensing elements such as thermocouples, resistance bulbs and other d-c output elements. No external converters with vacuum tubes and adjustments.

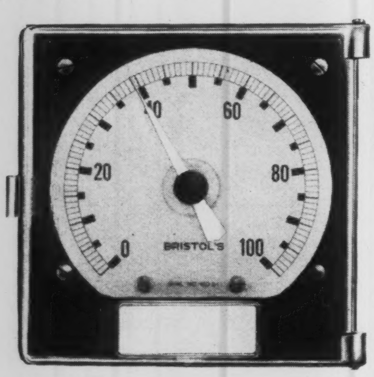
3. Full plug-in design. Change from an indicator to recorder with the same type of measuring circuit and terminal arrangement, or vice versa, in seconds. Or withdraw the chassis part-way for chart change or inking without disturbing operation in any way.

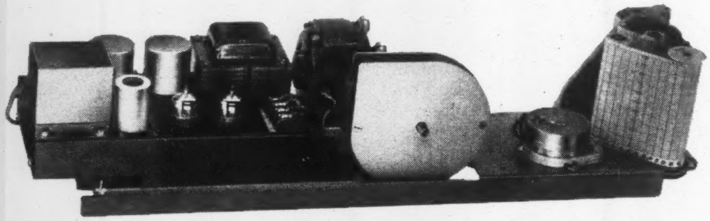
4. Easy range change in field. Just substitute desired range card; no soldering required. Wide variety of ranges and spans available.

5. Requires small panel space of only 5 x 5⅛ inches. Fifteen recorders or indicators mount in space required for two standard size electronic recording instruments.

Write today for complete data on the outstanding new Bristol Series 663 Dynamaster Instruments for your applications. The Bristol Company, 113 Bristol Road, Waterbury 20, Connecticut.

6.52





INDICATING RECEIVER (*left*) is interchangeable—in seconds—with recorder. Both indicators and recorders may be drawn to intermediate position for chart change, pen inking or inspection. Plug-in chassis (*above*) of resistance thermometer recorder. No external converter involving vacuum tubes and adjustments is required to operate Bristol's miniature Dynamaster instruments from resistance bulb thermometer or thermocouple.

Come and see us in Booth 301 at the 3rd International Automation Exposition

BRISTOL

TRAIL-BLAZERS IN PROCESS AUTOMATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

For more information circle **46** on inquiry card.

INSTRUMENTS and AUTOMATION

Biographies of significance

SIGNIFICANCE

The function of the Steam Efficiency & Combustion Department, Jones & Laughlin Steel Corporation, Pittsburgh Works Division, includes the responsibility for the supply of proper fuels to the various steel melting and heating units, the efficient production and consumption of utilities, the selection, installation and maintenance of instruments and controls and equipment related thereto. Robert Lambert, Superintendent of the Steam Efficiency and Combustion Department, is the man in charge of these basic instrumentation functions.

His biography reveals the type of functions—and the type of man who can carry out the functions—of the instrument man in the iron and steel industry. You will enjoy meeting Bob Lambert, and we enjoy acknowledging his key position within the field of iron and steel instrumentation, and his many contributions to it. Typical activities at his plant are shown on pages 1998 and 1999.

ROBERT A. LAMBERT

Robert (Bob) A. Lambert was born in Pittsburgh, Pa. on July 3, 1907. After graduating from High School in 1925, and with no funds for formal college training, he started employment with Jones & Laughlin Steel Corporation as a Clerk in their Machine Shop. For eleven years he attended night classes in Mechanical Engineering at Carnegie Institute of Technology. Bob also took several post-graduate subjects such as Heat Engineering and higher mathematics.

In the years at night school, knowledge was being acquired in Heat Engineering under the much-appreciated guidance of Prof. Willibald Trinks. In 1937 Bob was transferred to the Combustion Department of the plant, then under the direction of Mr. L. T. Pearsall. In late 1937, in a reorganization with instrumentation and plant utilities, he became Assistant Combustion Engineer for the plant.

Most work at this time was concentrated in improving fuel practice and production in the open-hearth shops. At this time the byproducts of tar became sufficiently attractive for outside sales and the resulting residual tar pitch offered challenging problems as to its utility as a fuel. (Today such fuel is one of the most desirable for open-hearth firing.) In the early days of its use, difficulties were encountered in handling and open-hearth operators were none too favorable for its use. Many obstacles had to be overcome.

In 1938, his night-school classes over, he married and acquired himself thereby a 12-year-old son. He and his wife now have two grandchildren in addition to the son and daughter-in-law.

For five years Bob directed activities of the Combustion Division, which grew to encompass instrumentation and controls at all locations in the Pittsburgh Works Division. Open hearths, soaking pits, sheet and strip mills and bar mills over these years went thru a period of improved combustion control for the heating and melting furnaces, with attendant instrumentation.

In 1945 Bob was appointed Assistant Superintendent of the Steam Efficiency and Combustion Department. In this position he absorbed responsibilities for plant utility consumption and conservation, as well as plant fuel consumption and conservation; there was also included the fast-growing instrumentation within the heating and processing functions of the plant.

Under the Penn State Extension Services of the School of Mineral Industries and the Pittsburgh Public Schools, Bob taught night school classes in Fuels and Combustion at the South High School for three years, 1949 thru 1951. To develop his plant organization (which comprised most of the class attendance) he wrote a text that is applicable to the fuel problems in the steel industry. The text continues to be used as a reference and guide, although it has never been copyrighted.

In 1947 he was appointed to the position of Superintendent of the department, and still holds this position. In 1953-1954 he served as Conference Chairman of the Symposium on "Instrumentation For The Iron & Steel Industry," as well as Vice President of the Pittsburgh Section of the Instrument Society of America. In the year 1954-1955 he served as President of the Instrument Society of America, Pittsburgh Section, and is now a member of the Pittsburgh Section Executive Board.

Bob's second love—a control instrument.

Bob tells us, "I have been a subscriber to *Instruments* magazine since about 1942 and have been reading it since 1940. Personally, I have found it very helpful over the years in keeping acquainted with not only new products on the market, through advertising, but also in keeping abreast of instrument applications in the various industries. The magazine receives wide circulation in the department, although there are several members in the department who subscribe for their own copy. *Instruments and Automation* magazine, I believe, is the best in the field."

Bob is a licensed Professional Engineer of Pennsylvania, and his technical activities include membership in the Instrument Society of America, Engineers Society of Western Penna., Association of Iron & Steel Engineers, and the American Institute of Mining & Metallurgical Engineers. He has presented numerous papers relative to instrumentation and combustion as associated with the Steel Industry, which have been inserted in the records of their societies.

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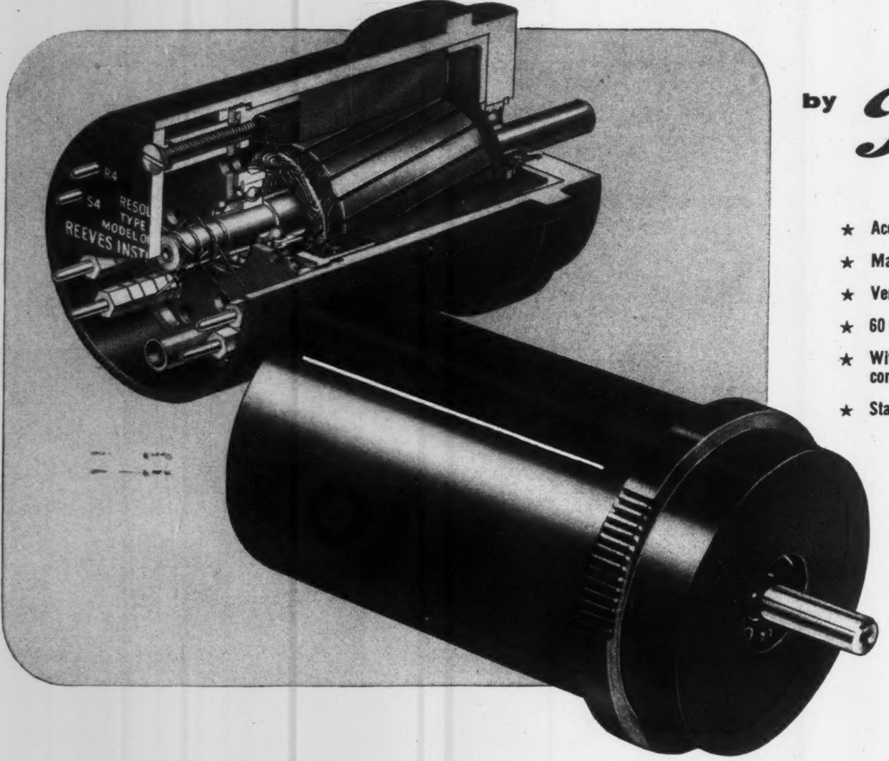
by Reeves
INSTRUMENT CORPORATION



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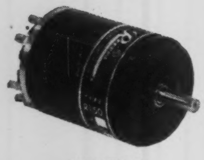

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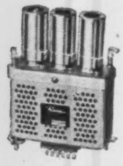

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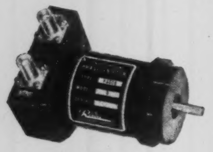

PHASE SHIFTERS

CONTINUOUS RESOLVER CHECKER

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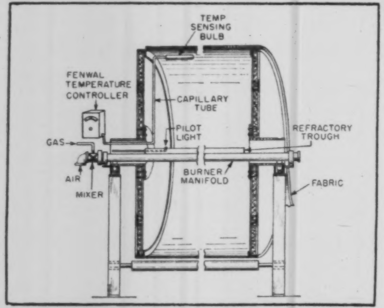
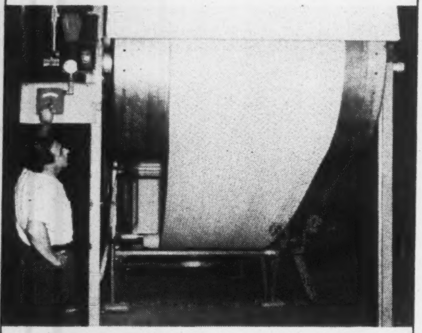
The drum is usually operated at a surface temperature of 350° to 450°F, but can maintain temperatures up to 700°F, as required. The revolving drum surface is heated by a combination of infra-red rays and convection from a refractory trough heated to incandescence (about 2400°F) by a gas-air manifold burner.

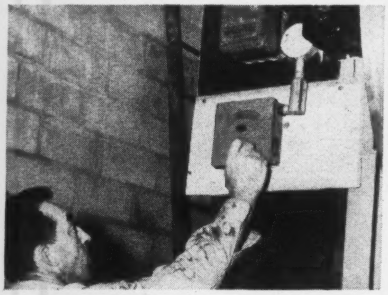


Drum temperature is controlled by a Fenwal Series 540 Indicating Temperature Controller. As shown in the diagram, this is connected by a capillary tube to the temperature-sensing bulb, located close to the interior surface of the drum. The trough and manifold are stationary along the axis of the drum. Flame is played along the surface of the trough by a series of jet nozzles, burning a mixture of air and natural or manufactured gas. To aid in preventing scorching the product, materials used for the drum and heater system are of lowest practical heat capacity. The drum surface is of 16-gauge steel, which assures a low heat content.

Also, the combustion air supply doubles as a coolant for the drum. The air stream is not tied in with the temperature control system and continues to flow after the gas is shut off. Thus, it quickly cools the heater trough and blows the heated air out of the drum. This, plus the low heat capacity of the drum surface, provides the required safeguard against scorching the product during sudden shut-downs.



PRECISE TEMPERATURE CONTROL, provided by a Fenwal Series 540 Temperature Indicating Controller (shown at left) is one of the advantages enabling this huge drying drum to set new records for efficiency. In one installation, three 60″ diameter drums of this type are drying the same yardage as 20 previously used steam-dryers.

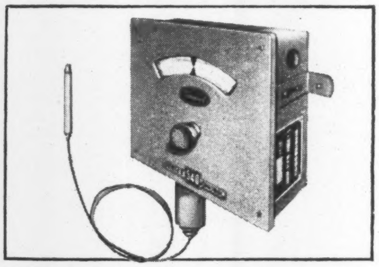


Control Within ¼ of 1%

When the operator sets this Fenwal Series 540 Controller to the required processing temperature, he knows that temperature will be maintained — on the button! Heat input is controlled by the Fenwal unit, actuating a solenoid valve in the supply line. The gas, maintained at atmospheric pressure by a diaphragm regulator, is drawn into a proportioning mixer valve under negative pressure created by the air stream. The air supply, maintained at approximately one psi, reaches the mixer through a separate supply line.

With the Series 540 Control on guard over the heating system, the manufacturer of this advanced drying equipment states that the temperature of the drum surface is maintained within ± one-quarter per cent of the controller scale — outstanding performance for processing equipment of this type.

A Versatile Instrument



The Series 540 Controller is fully adjustable between 100°F and 700°F. Temperature differential is adjustable between 1% and 4% of scale temperature ranges by internal adjustment of pilot contacts. Uniform sensitivity and close accuracy throughout its range are characteristic, making it an ideal temperature indicating controller for kilns, ovens, liquid baths, baking ovens, packaging machinery and general industrial processing.

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Investigate the many different types of Fenwal temperature control and detection devices. Besides the Series 540 described here, these include standard THERMOSWITCH® units, Midgets, Miniatures, etc. Send the coupon for new Catalog No. 500. Remember that Fenwal's engineering staff is always ready to help you solve any temperature control problem.

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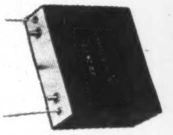

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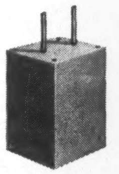

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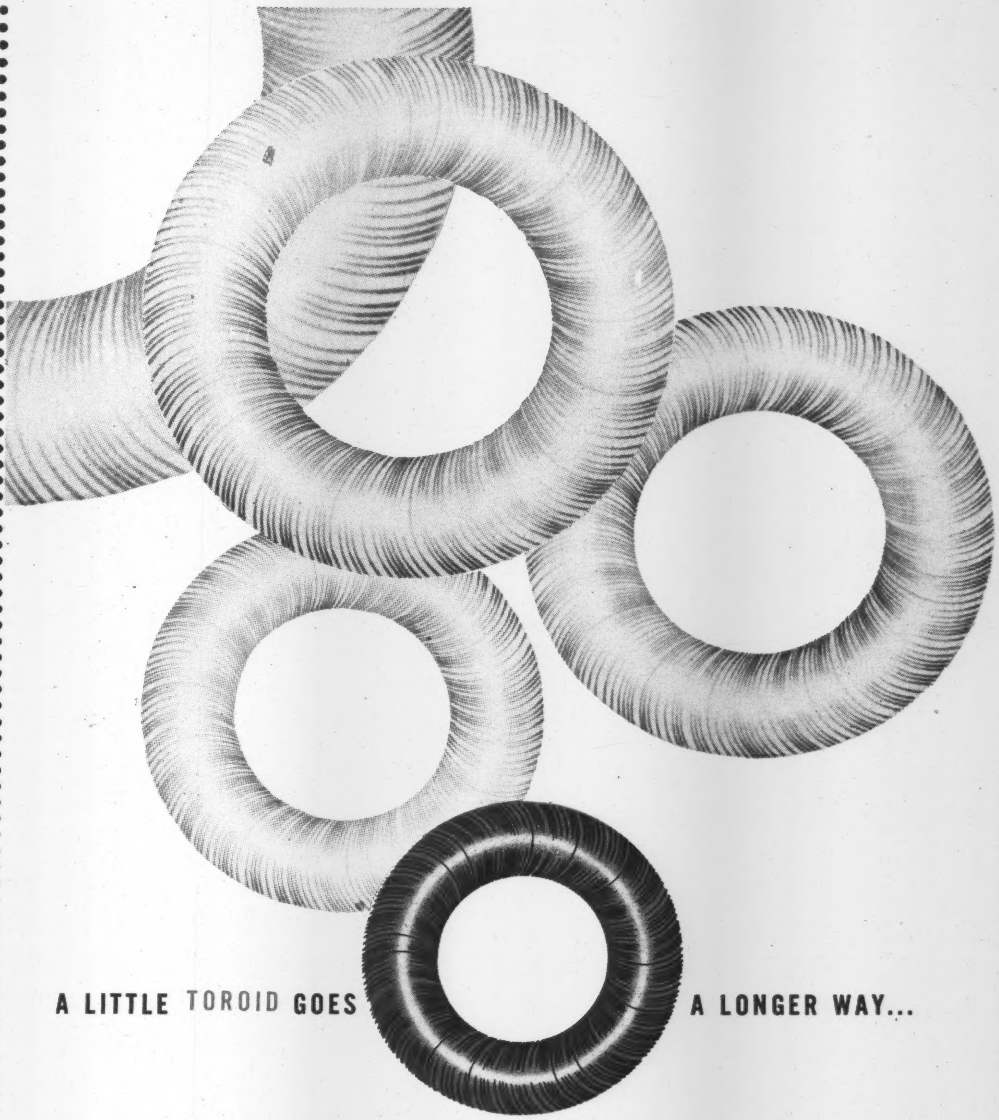

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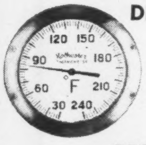

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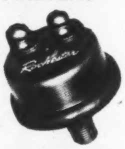

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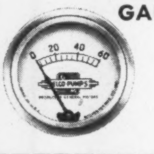

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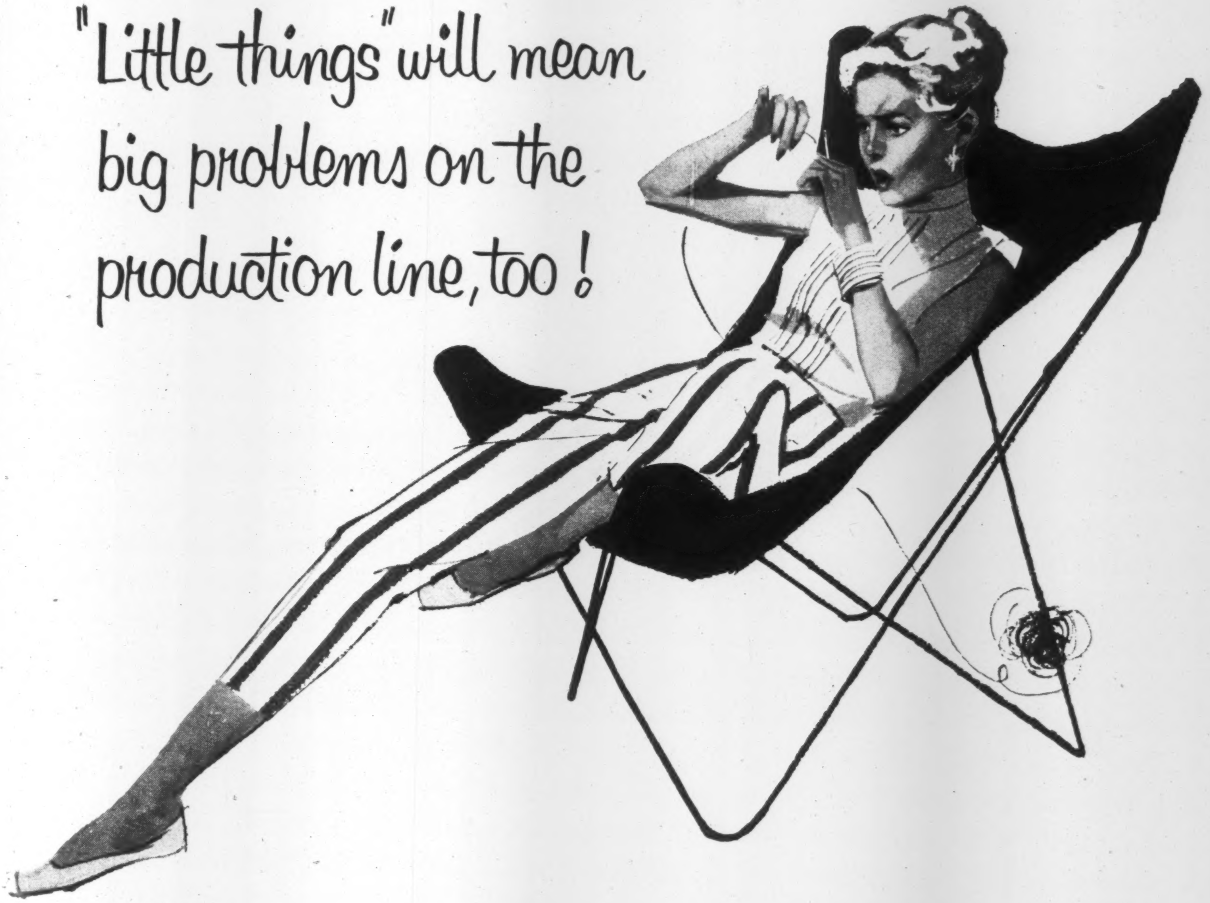

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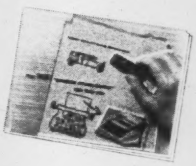

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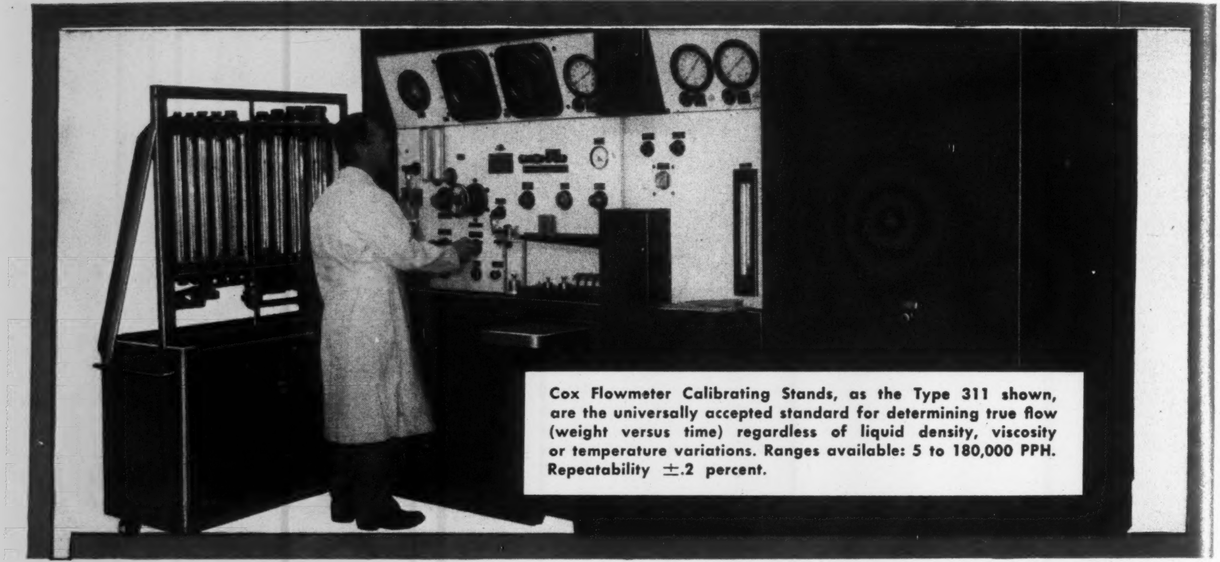

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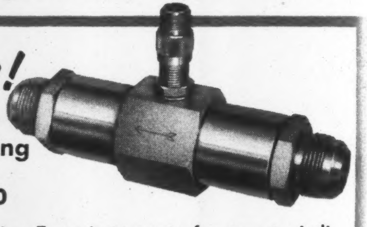

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*± .5 of flow *at any point* in the range of the instrument.

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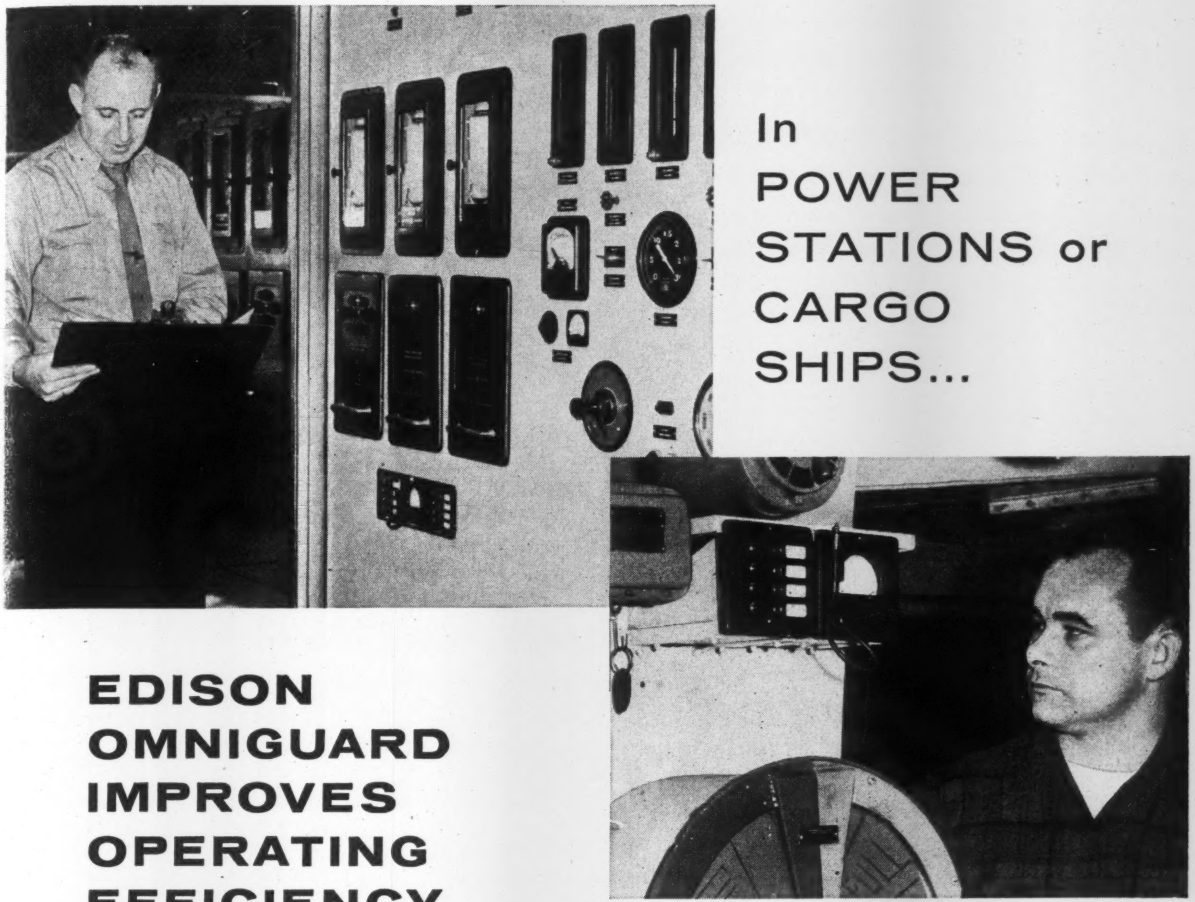

In POWER STATIONS or CARGO SHIPS...

EDISON OMNIGUARD IMPROVES OPERATING EFFICIENCY

Whether you're seeking more production from electric power stations and plant equipment or greater safe speed from seagoing vessels, you will find Omniguard can help you get more efficiency from your present equipment.

Many operators are already using Omniguard, the unique temperature indicating and alarm system designed by Thomas A. Edison, Inc., as the best means of eliminating waste due to downtime, repairs and lost production.

Omniguard improves plant efficiency and lets you operate at peak capacity because it unfailingly reports when dangerous temperature conditions occur at one or more points. And does it at surprisingly low cost.

A modular system of monitoring one to an unlimited number of points simultaneously, Omniguard watches continuously. When a bearing starts heating up or a process becomes critically hot, it automatically gives a warning and/or shuts down the equipment before it is damaged.

The low cost unit is easy to install. It is non-electronic and simplifies installation and maintenance through the use of copper wiring between all components.

See for yourself. A personal demonstration can be arranged at your own plant. Take it apart. Analyze it. Find out how simply Omniguard improves operating efficiency. Just write!

Thomas A. Edison

A GREAT NAME CONTINUES GREAT NEW ACHIEVEMENTS

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DATRAC
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RIGHT NOW...

Over 100 Epsco high speed reversible voltage-to-digital converters are in operation at over 25 separate commercial and military activities throughout the world.

No other voltage-to-digital conversion equipment presently available anywhere will approach the accuracy, conversion speed, reliability, long term stability, versatility and simplicity of operation of the Epsco Model B DATRAC® . . . regardless of price!

MODEL B DATRAC® FEATURES

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CONVERSION SPEED: 44,444 independent V→D conversions per second for an 11 bit binary code including sign.

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INPUT (V→D): ±10 millivolts to ±1000 volts differential or single ended.

OUTPUT (V→D): Binary or binary coded decimal.

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ASSOCIATED EQUIPMENT

- Electronic Multiplexers
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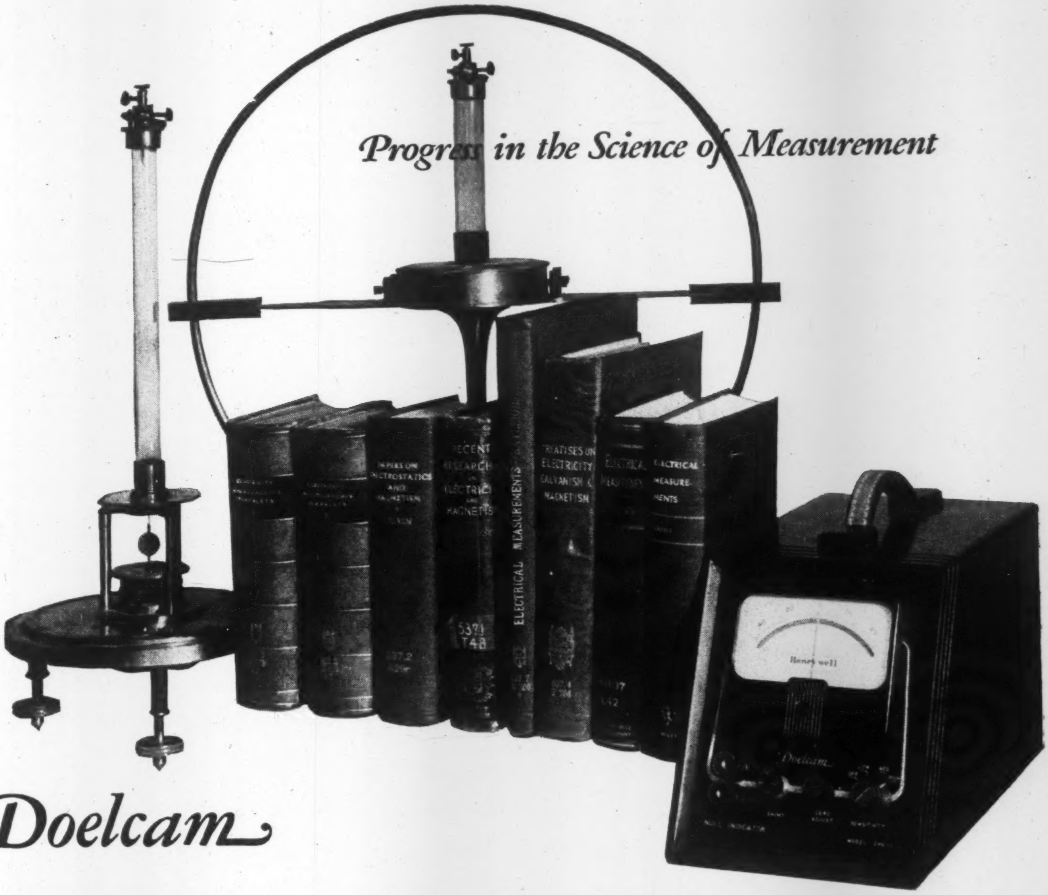

Doelcam

MAGNETIK NULL INDICATOR

Today's Version of the D-C Galvanometer

The D-C Galvanometer was essential to the historic experiments in electricity conducted by men like Galvani, Ampère and Lord Kelvin. However, the dense stray fields of today's electrical world combined with the need for greater speed and accuracy in the laboratory and on the production line place a heavier burden on the present day galvanometer. The Doelcam Magnetik Null Indicator, Model 2HG-1, is today's most practical version of the D-C Galvanometer. Not only does it combine magnetic and electronic elements which make it insensitive to stray pickup; but it has 3 discreet ranges, a linear scale for deflection measurements, fast response and the ability to withstand overloads as high as 100,000 times full scale deflection.

Write for Bulletin NI-4

PERFORMANCE CHARACTERISTICS

ISOLATED INPUT: Input terminals are isolated from chassis and circuit ground.

HIGH SENSITIVITY: 2 Microvolts per division, 0.003 Microamperes per division.

HIGH CONVERTER FREQUENCY: 2500 cps carrier, insensitive to 60 or 120 cps pickup.

LOW NOISE LEVEL: Less than 2 Microvolts equivalent input.

EXCELLENT STABILITY: Zero drift less than 1 division per hour.

INDEPENDENT OF LINE VOLTAGE: No observable drift or change in sensitivity for line variations from 105 to 125 volts.

PROPORTIONAL DEFLECTIONS: Linearity over full scale range is 5%.

POLARITY SENSITIVE: Zero-center mirror-scale meter for polarity sensing measurements.

QUICK READING: Time constant of less than 1 second.

RUGGED: Not damaged by over-range of 45 volts d-c.

LOW MAINTENANCE: Only one vacuum tube. No moving parts except meter.

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A DIVISION OF MINNEAPOLIS-HONEYWELL

1400 SOLDIERS FIELD ROAD
BOSTON 35, MASSACHUSETTS

Instruments for Measurement and Control

Synchros • Gyros • Accelerometers • Amplifiers • Microsyns • Servo Motors

For more information circle **56** on inquiry card.

F.C.C. RADIATION INTERFERENCE LIMITS

Effective May 1, 1956 all radio receivers manufactured to operate in the range from 30 to 890 mc, including f-m and television receivers, shall not exceed the following field strength limits at 100 feet or more from the receiver:

The total electromagnetic field at any point a distance of $\frac{157000}{f(kc)}$ ft. (equivalent to $\lambda/2\pi$) from the apparatus shall not exceed 15μv per meter. Radiation generated by oscillator sweep circuit must also be controlled.

COMPLY WITH F.C.C. REGULATIONS

Use Allen-Bradley Feed-thru and Stand-off Capacitors

Type SO with solder tabs

Type FT with solder tabs

Type FC Ferri-Cap filter

This new F.C.C. regulation on radiation interference imposes stringent requirements on radio and TV designers. Fortunately, Allen-Bradley Types FT and SO discoidal capacitors and Ferri-Cap filters completely satisfy these requirements.

Both Type FT (feed-thru) and Type SO (stand-off) can be supplied in standard nominal capacitance values from 5 mmf to 1,000 mmf. None of these Allen-Bradley units exhibits parallel resonance effects at frequencies of 1,000 megacycles or less.

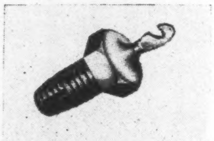
Type FT feed-thru capacitors have soldering tabs or screw-thread mounting. Type SO stand-off capacitors are available with screw-thread mounting, self-tapping threads, or solder tabs.

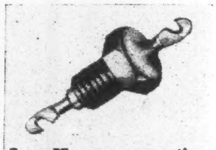
The rugged construction reduces breakage during assembly line handling or from contact with carelessly handled soldering irons. The terminals are specially treated for easy soldering.

The Type FC Ferri-Cap feed-thru filter is a discoidal feed-thru capacitor in combination with ferrite material to provide internal impedances effectively in series with both ends of the feed-thru electrode of the capacitor. The Ferri-Cap filter is not susceptible to pickup, and does not require physical isolation with respect to the source of an undesired frequency.

Send for bulletin, today.

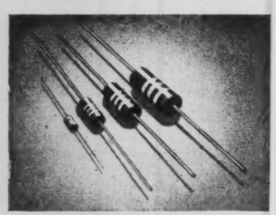
Type SO—screw mounting

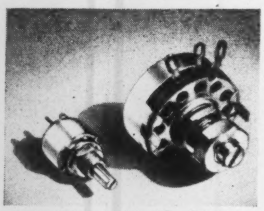

Type SO—self tap. screw


Type FT—screw mounting

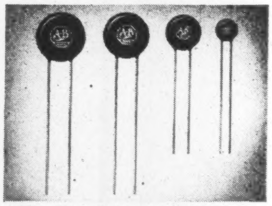
Allen-Bradley Co., 140 W. Greenfield Ave., Milwaukee 4, Wis. • In Canada—Allen-Bradley Canada Limited, Galt, Ont.

OTHER QUALITY COMPONENTS FOR RADIO, TV & ELECTRONIC APPLICATIONS


Fixed Molded Resistors
1/10, 1/2, 1 & 2 watt


Variable Molded Resistors
1/2 & 2 watt

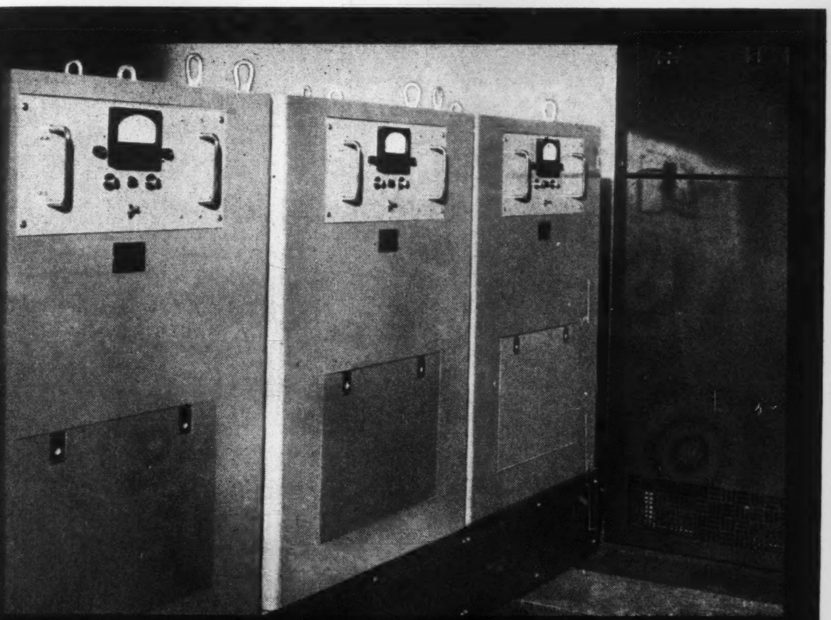
Ferrite Components
High Efficiency


Ceramic Dielectric Capacitors
for by-pass and filtering

ALLEN-BRADLEY

RADIO, ELECTRONIC AND TELEVISION COMPONENTS

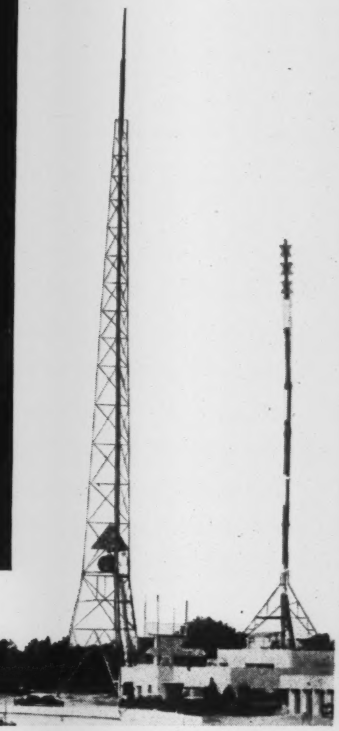
For more information circle 57 on inquiry card.



The STABILINE Automatic Voltage Regulator installation at station KTTV. Input: 215-245 volts, 50/60 cycles, 3 phase. Output: Individual Phase Control, 220 volts, 525 amps., 200 KVA.

Electronic equipment is designed to operate at specified voltages. There is no easier or better way to maintain constant voltage to electrically-operated equipment than with a STABILINE type EM. Available in standard models in capacities up to 100 KVA, a STABILINE type EM is highly efficient and has zero waveform distortion. To eliminate your Varying Voltage Troubles, install a STABILINE Automatic Voltage Regulator.

How Time Worth $1000 a Minute is Protected by a STABILINE* *Automatic Voltage Regulator*



Station KTTV, Mount Wilson, California, is owned by the Los Angeles Times.

At Television Transmitter Station KTTV a STABILINE Automatic Voltage Regulator has been in continuous operation, with no replacement of parts, for over two years. *By maintaining constant voltage to the transmitter, it has already paid for itself.* Expensive transmitter tubes require constant voltage for peak performance and long life.

At literally no cost, this STABILINE type EM helps to keep the station on the air by preventing lost time (worth nearly $1000 a minute) due to tube failure.

Be sure to visit SUPERIOR ELECTRIC'S Mobile Display when it is in your area

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710 MIDDLE STREET, BRISTOL, CONNECTICUT

Please send me your STABILINE Bulletin S157.

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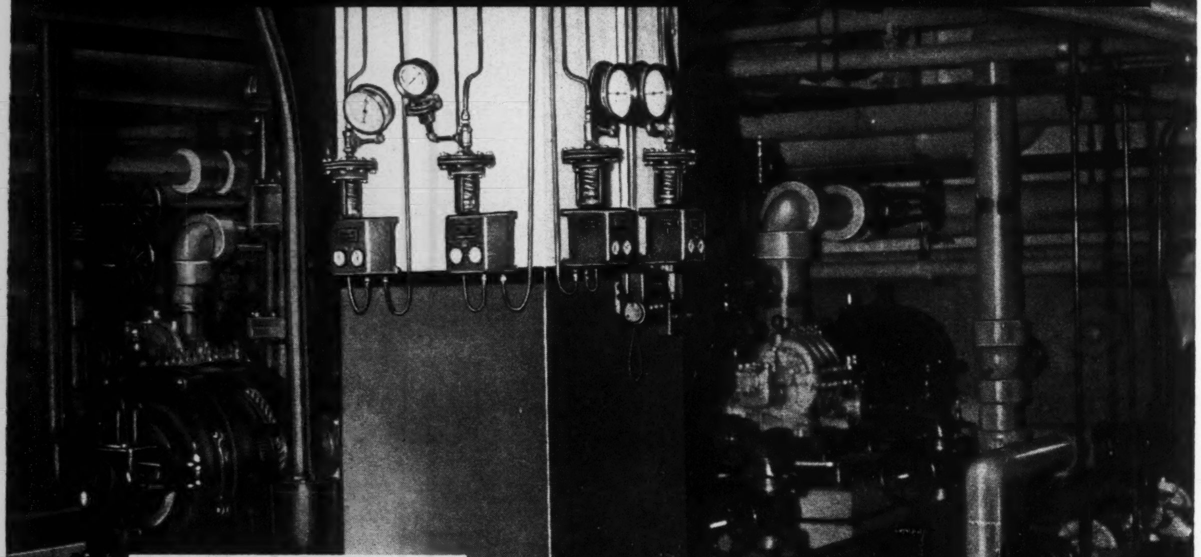
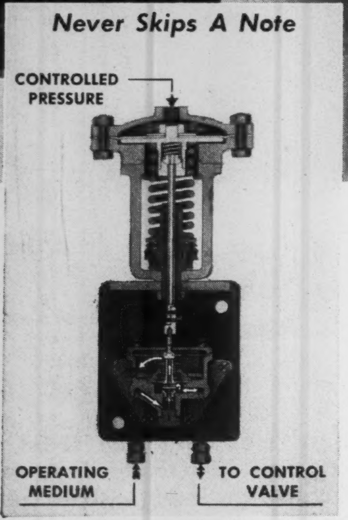
Here's a Quartet of Control Pilots that Sings a Song of Savings



Never Skips A Note



Leslie Control Pilot
Type PDA
Sectional View

NEVER A DISCORDANT NOTE from this quartet - - - they're always in tune - - - each unit doing its part to create 24-hour-a-day harmony. They save time — no personal attention or manual assistance required after they're set. Pressures stay at set point for top efficiency of process equipment in the line. Positive response of pilot and valve assures smooth throttling action within closely held limits.

The same smooth action and accurate control is provided even when extreme reductions are necessary (there are Leslie installations handling reduction of 2150 psi. to 5 psi. in one step!) Responds to pressure deviations as small as .025 psi., depending on pilot range.

For more information on controllers that save maintenance dollars, consult the nearest Leslie Engineer listed in your classified telephone directory under "Valves" or "Regulators". Use this help for economy in temperature and pressure regulation.

Bulletin 5303 sings the whole song. Send for it today.

TRADE
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REGULATORS AND CONTROLLERS

LESLIE CO., 299 GRANT AVENUE, LYNDHURST, NEW JERSEY

For more information circle **59** on inquiry card.

How Brush Magnetic Heads improve product performance

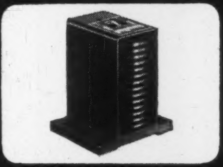
Microscopic inspection is a familiar tool in Brush's manufacturing of magnetic heads. Track width and gap alignment must be held to ten-thousandths; pole faces and tips must be lapped to a surface finish of better than 8 microinches.

This craftsmanship improves product performance. Precision gap alignment assures perfect time phase accuracy. Close tolerances permit greater pulse packing, increased storage capacity, uniform output and frequency response.

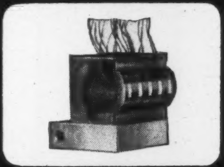
Get the facts on Brush's complete line of magnetic heads, including the new precision multichannel heads. Write Brush Electronics Company, Dept. A-10, 3405 Perkins Avenue, Cleveland 14, Ohio.

BRUSH ELECTRONICS COMPANY
3405 Perkins Avenue, Cleveland 14, Ohio
DIVISION OF
CLEVITE CORPORATION

BK-3300, BK-3500, BK-3700—ultimate in precision made multichannel heads.

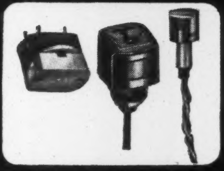


BK-1300, BK-1500 series—up to 25 interlaced channels per inch.

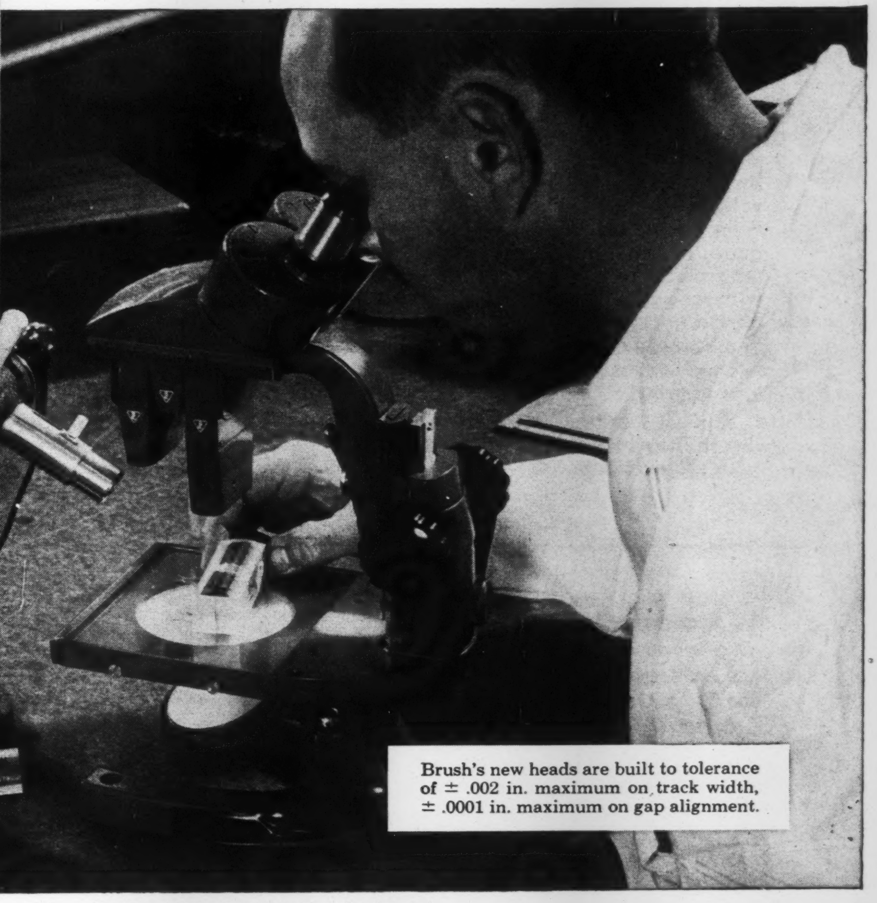


BK-1605 series—simple mounting and adjustment, ideal for drum computers.

BK-1501 series—compact, wafer-thin, permit individual adjustment.

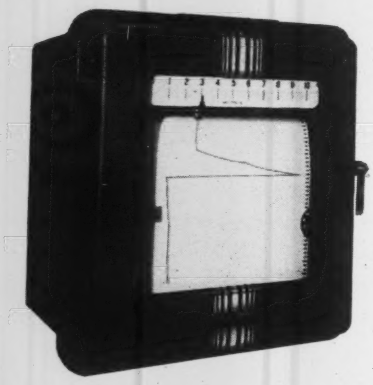


BK-900, BK-1000, BK-1200 series—variety of types for single channel applications.



Brush's new heads are built to tolerance of ± .002 in. maximum on track width, ± .0001 in. maximum on gap alignment.

For more information circle **60** on inquiry card.



SAVE

Data Plotting

TIME

With Speedomax® G Millivolt Recorders

- Measuring a physical or electrical quantity that can be converted into d-c millivolts? Then you can eliminate costly, time-consuming point-by-point plotting with one of L&N's complete line of Speedomax G Millivolt Recorders. You may require: stocked 0 to 10 millivolt recorders for general research and testing; recorders with special millivolt ranges for particular applications; logarithmic recorders for non-linear measurements; and microvolt or medium high impedance recorders for special uses.

These listed specifications may help you determine which millivolt recorder meets your requirements.

1. STANDARD MILLIVOLT RECORDERS

(Normally available for delivery from stock)

MEASURING CIRCUIT—D-c potentiometer.

ELECTRICAL RANGE—0 to 10 mv.

DEAD BAND—0.15% of range.

ACCURACY RATING—±0.3% of range.

SPAN STEP RESPONSE TIME RATING —1 or 2 seconds.

2. SPECIALIZED MILLIVOLT RECORDERS

MEASURING CIRCUIT—D-c potentiometer.

ELECTRICAL RANGE—Min. 0 to 1 mv; Max. 0 to 1,000 mv.

DEAD BAND—0.15% of electrical range, or 7 µv, whichever is larger.

ACCURACY RATING—±0.3% of scale span, or ±15 µv, whichever is larger.

SPAN STEP RESPONSE TIME RATING —1, 2, or 3 seconds nominal.

3. LOGARITHMIC MILLIVOLT RECORDERS

MEASURING CIRCUIT—D-c potentiometer.

ELECTRICAL RANGE — Min. starting point: 1 mv. Maximum full scale—1,000 mv.

LOGARITHMIC CALIBRATIONS—1, 2, or 3 cycles.

ACCURACY RATING—For 1 and 2 cycle logarithmic scale calibrations: ±0.7% x number of cycles. For linear scale calibrations (density, etc.): ±0.3% of scale span.

4. MEDIUM-HIGH IMPEDANCE RECORDER

MEASURING CIRCUIT—D-c potentiometer.

ELECTRICAL SPAN—Minimum span of 10 mv at resistances up to 100,000 Ω, 20 mv at 1 megohm.

INPUT IMPEDANCE—2 megohms.

EXTERNAL CIRCUIT RESISTANCE—As high as 1 megohm.

DEAD BAND—0.2% of electrical span.

ACCURACY RATING—±0.3% of electrical span.

5. MICROVOLT RECORDER

MEASURING CIRCUIT—D-c potentiometer.

ELECTRICAL SPAN—400 µv min., 2 mv max.

DEAD BAND—0.2% of electrical span.

ACCURACY RATING—±0.5% of electrical span including allowance for dead band and thermals.

For more information on this versatile line of Speedomax Millivolt Recorders, ask our nearest Sales Office for Data Sheet E-ND46(6) or write to Leeds & Northrup Company, 4955 Stenton Ave., Phila. 44, Pa.

LEEDS LN NORTHRUP
instruments *automatic controls • furnaces*

For more information circle **61** on inquiry card.

INSTRUMENTS and AUTOMATION Editorial

AUTOMATION: The use of devices—mechanical, pneumatic, hydraulic, electrical and electronic—for making automatic decisions and efforts.—***M. H. Aronson,*** Editor

A New Concept

STATISTICS on modern giant trade shows such as the IRE or ISA or WESCON reveal a growth that is gratifying to our field of instrumentation—the orders of magnitude are now visitors by the scores of thousands, and exhibits and papers by the hundreds. But this growth has brought its problems.

It is now physically impossible for a man to do much more than glance at most of the exhibits, or listen to more than a few papers. In fact, one often precludes the other. The show visitor must allot his time to a small percentage of exhibits, listen to a few papers, or talk to a small number of exhibitors.

Still other problems have arisen. Hundreds of the top men responsible for the activities of society-sponsored shows spend much of their time in committee activities; they see even less of the show than the non-society visitor. The exhibitor is told that 40,000 men attended the show in which he exhibited. The number might as well be 400,000—he and his staff could only talk briefly to a few hundred men. And the now vast areas of floor space prevent the average visitor from even seeing the name of the product, let alone discussing its application. The educational efficiency of the present setup is becoming smaller as the simultaneously held exhibits and conferences become larger in number and size.

For these reasons the conversion of a trade show into a giant classroom in the hours when the show is not open to the public represents a fundamentally new concept in trade exhibition and mass education, a concept that could eliminate the inherent and growing educational weaknesses in the modern trade show as it now exists. At the Third International Automation Exposition, which will be held Nov. 26-30 (Automation Week) in New York City, more than 300 90-minute technical classes will be held in front of the operating equipments on exhibit. Lecturers will demonstrate how available commercial equipments solve the problems of plant, factory and office automation—not theoretically or generally; but practically and actually, using operating equipments. Thousands of registrants will receive a basic education on analog computers, digital computers, servomechanisms, data handlers, process control, office automatic, machine tools, and automatic gaging, cleaning, and fabricating. This new concept may reverse the trend to lowered educational efficiency in trade shows, and merits the close attention of our entire industry.

ISA Show Highlights

THE 1956 ISA Conference and Exhibit was a huge success by every criterion—attendance (over 35,000) exhibits (nearly 400), papers (about 130) and financial ($285,000 gross take). Perhaps the only detectable weakness was in the quality of some of the papers presented, and in the attendance at some of the technical sessions and clinic classes.

It is of interest to note the power of propaganda and excitement; there was more interest in the IGY sessions where the instrumentation is relatively exotic than in the clinic classes where good practical application and maintenance material was to be had. The data-handling workshop was an outstanding success, further evidence that this field has at last arrived at the acceptance stage (the primary evidence being the orders for systems now on the books of the suppliers).

Many show viewers, looking for exciting disclosures, expressed dissatisfaction. This attitude was caused in part by the mass of conventional instrumentation, tending somewhat to overshadow the many novel instruments disclosed, and in part by the fact that all instruments evolve through three basic stages—(1) the "disclosure" stage, accompanied by revolutionary claims and high excitement, (2) the "proving" stage, accompanied by usually years of eliminating bugs, solving application problems, and adding up huge figures in debit columns, and (3) the "acceptance" stage, exemplified by backlogs of orders. Perhaps the big news of this show is that data-handling equipments have arrived at stage 3—acceptance. This year, all exhibited data-handling systems worked, and orders were entered on backlog only by most exhibitors. Data handling has arrived.

In contrast, computers are only now going through the horrible stage 2—horrible no less to the engineers behind the development than to management. Perhaps this is why few computers were exhibited, compared to previous years. However, we predict a complete break-through in the computer field—particularly the analog computer in process applications—within the next few years.

In this respect two papers should be mentioned—(1) *Analog Simulation of a Chemical Reactor* by Bagde, Franks, and James of DuPont, Wilmington, and (2) *Application of the Analog Computer to Measurement of Process Dynamics* by Cowley, of Shell Development, Emeryville, ASME Paper 56-IRD-20.

Continued on page 1966

EDITORIAL—CONTINUED

Another theme of the show was the building-block approach to control systems. Bailey had this as the theme of their exhibit, and many process control firms showed their unitized elements. Illinois Testing Labs introduced a line of "Servoblox" units—amplifiers, bridges, digital readouts, recorders, etc. Dozens of firms offered unitized subassemblies.

It is fashionable to note the progress of transistors. Manning, Maxwell & Moore has transistorized the Microsen line of process controllers, making it the first transistorized line of general-purpose electronic process controllers. Daystrom has transistorized some beautifully miniature servos and receivers and Offner has transistorized the new Type 542 Dynograph—but some electronic instrument manufacturers seem held back from transistorization by several reasons, one of which is lack of acceptance by servicemen in the plant (a factor of high importance and one often ignored in technical discussions).

Also evident as a trend is the manner in which the larger firms are emerging as integrated companies either via purchase of several smaller companies in associated fields or by development of comprehensive lines of associated instruments. Large plant constructors are already finding it economic to turn over all instrument problems in a given field, such as all the analytical problems and analytical instrumentation in a proposed plant, to an instrument company specializing in this field. For example, all the analytical instrumentation for a new ammonia plant was recently subcontracted to the Beckman Instrument Company, which used the instrumentation of other manufacturers as well as its own, as required. The Beckman display itself (and a special press conference) was designed to show the integrated operations of their various divisions; other exhibits, particularly the Fischer & Porter, Consolidated Electrodynamics, Minneapolis-Honeywell, General Electric and Daystrom used the same theme—the ability of the integrated company to bring a veritable powerhouse of equipment and experienced engineering brains to bear on any given problem in the field of specialty.

Your editors will try to summarize a few of the many show "firsts," particularly those which might be overlooked by the sensation seekers. We begin with apologies to the hundreds of products that will not be mentioned—no show report could include every new development exhibited. (This is why most editors confine their reports to glamorous pictures and innocuous comments on meetings and personalities.) But the new products are the real show news.

1. Norden-Ketay (Instruments & Systems Division) revealed a basic new Bourdon pressure-gage movement, the "Bandrive," which uses a simple Neg'ator strip to replace the conventional segment gear, pinion, and hairspring. Advantage: up to 20 times the life of the standard movement in rough, vibrating service.

2. Edge-lighted plastic digital readouts were everywhere—but watch the new Nixie and Pixie numerical indicators disclosed by Burroughs Electronic Tube Div. These cold-cathode-type readouts have less parallax difficulty. The Berkeley in-line readout is readable from a side angle because it uses "grain-of-wheat" lamps arranged in patterns behind slots, whence no "stacking" of numerals and no blurring at all.

3. There was a lot of valve news—the brand new electrohydraulic operator of Mason-Neilan that uses a differential transformer in the feedback loop; the new Type C Vernier Valvactor positioner of Foxboro; the new electro-pneumatic positioner of Moore Products that uses a coil in a magnetic field to operate a pilot; the new all-electric valve actuator of Conoflow that requires 4 ma dc signal to stroke the valve (principle is a force-balanced differential transformer); the new Super 70 Series valves of Black, Syvalls & Bryson that use float rings instead of flange-type bolting.

4. The monitoring and data-reduction news included the pinboard programmer for the Beckman data control system; an operating MilliSADIC of CEC in their mobile van (special orchids to the CEC "classes" that demonstrated the operation in 20-minute sessions in the CEC Van—see pic); a 120-point scanner-logger of Minneapolis-Honeywell; the E101 digital computer of Burroughs, whose big feature is pinboard programming that is easy to learn; new digital printers of Victor Adding Machine that print 3 lines/sec, 10 characters/line; a new APR automatic production recording system of IBM for handling production-type data (where was the RAMAC?); the new 50VS (operational visual sequence) monitoring technique of Panellit in which the *first* off-normal variable flashes red; the Metrotype data logger with a plug board for setting up the variables and scales.

5. There were a lot of exciting recording developments. Bristol unveiled a miniature Dynamaster recorder with a 3″ strip chart. We acclaimed the Century Electrograph recorder and the Acton carbon-coated acetate-film recorders when they were disclosed at the IRE Show; Offner disclosed its transistorized Type 542 Dynograph and made a first disclosure of a Dynograph recorder with either rectilinear, curvilinear, heat-sensitive, electric or ink recording all in one recorder(and when you need one type of recording technique you need it badly; if only for a short time); Sanborn revealed a new automatic programmer for a computer that prints the zero references, inserts calibrating voltage into each channel, switches to computer input, runs off a given length of paper, and returns to zero (this can be a real test automation device); Potter Instrument exhibited the new 3-ms start-stop digital tape handler; Varian introduced the new G-11 strip-chart null-balance recorder that is small, portable, and rack or panel mountable (feature is economy at the expense of slight reduction in speed and accuracy).

6. Fielden revealed new pneumatic-electric-pneumatic conversion units that convert process variables to 3-15 ma dc (transmitter) and reconvert to 3-15 psig pneumatic signal (receiver) without vacuum tubes (transmitter principle is bellows, beam, coil in magnet field, and carbon-pile pressure-sensitive electrical resistance). Fielden has been pushing for a 3-15 ma standard electrical signal to correspond to the 3-15-psig pneumatic standard; sounds logical at a time when it appears that hybrid electric-pneumatic systems are optimum for many applications (as brought out in Paper 56-28-1). This important "PEP" conversion system permits electrical transmission techniques to be used with any pneumatic control system.

7. SIE introduced a flow computer Type DRF that

OLIDATED
CTDYNAMICS

Amid the hundreds of displays were two mobile units—the Consolidated Electrodynamics van shown here and the Benson-Lehner van.

Show visitors hear how *Instruments & Automation* covers the field of instrumentation with more than 2000 pages of copy, 2000 new instrument reviews, and 2000 literature reviews each year.

extracts the square root of a pressure head by electronically taking the log of the pressure differential (with a log network), then dividing the electrical signal in half. Any other power can be taken easily by this technique. The antilog is found simply by a log network in a feedback circuit. Comparison of this flow computer with the Librascope flow computer shows the difference between an electronic and a mechanical approach to the same problem.

8. Norwood Controls reavealed the Deltaswitch Hg-jet commutator, featuring 120 contacts, rotor speeds of 6000 rpm, and interruptable current of 75 ma. Also disclosed was a "Microsyn" rotor-stator-type pickup with 12 poles on the rotor, 24 on the stator; 0-10-v ac output is developed with rotational motion of only 2½° of rotor. Pressure instruments were shown with this pickup.

9. Hundreds of other items deserve mention, including the *Decker* line of instruments based on the T-42 transducer (the sensation of an earlier show); the *Dekoron* Super Poly-Cor plastic tube in a plastic shield with life up to 3.5 times that of copper in a metal sheath; Servotherm heat detectors (infrared) of *Servo. Corp. of* America with response of ¼ second and sensitivity of 0.05°C; the Barber-Colman Wheelco MMP magnetic modulator for converting d-c signals into a-c for amplification, and which acts also as an adder for the error signal; the *Technical Products Co.* TP-625 Frequency Analyzer that analyzes frequency and amplitude by Fourier technique within frequency range of 2 to 25,000 cps (user can look at any 2 cps); *The Edin Co.* Spectrum Analyzer with 24 selectable bands by plug-in filters (analysis is performed over successive 10-second periods); the *B&F Instruments* automatic bridge balance and calibrating unit featuring series as well as shunt calibration; the *Intercontinental Dynamics Corp.* Sigmatron random noise generator, designed for simulation via random-frequency signals; the *Precision Scientific* automatic distillation unit for petroleum and solvents that plots temperature vs. volume with capacity of 100 ml; the new *Mine Safety* "Thermatron" that uses both thermal conduction and thermal convection to increase the selectivity of gas analysis; the *Baird-Atomic* Turbistat that monitors turbidity (by photoelectricity) in fluids and suspensions to 0.05 ppm, and also a lab gas analyzer said to be "first negative-filter non-dispersive analyzer available for lab use" that can analyze all gases except the diatomics; the new Merchen pneumatic scale feeder of *Wallace & Tiernan* featuring a pneumatically controlled gate; a new automatic film processor of *Hathaway;* the new d/p transmitter and valve manifold Type ESV of *Republic*, consisting of two line shutoff valves and two equalizing valves with a vent plug, designed to minimize the problems in manifolding differential-pressure instruments; the complete line of graphic panel instruments by *Bristol;* the 3000 Series control valves of *Hammel-Dahl*, featuring calibrated hysteresis test of every valve; the direct-reading digital-readout flowmeters of *Fischer & Porter;* the frequency meters and monitors of *Biddle*, using reeds and featuring accuracy to 0.1%; *Bendix-Pacific's* digital calendar-clock . . . . . . **MHA**

Some Conference and Show "Firsts"

M. F. BEHAR

OF prime historical importance and scientific value was Dr. Raymond Jonnard's disclosure via a Conference paper of a new type of interferometer which gives science and industry one more decimal place—eight instead of seven. And Jonnard in the nineteen-thirties and forties had done much to refine interferometry from six to seven decimals! His monumental achievement received no publicity outside the Conference program, but it will be included in all future books on optics because it combines several "firsts," among them the first application since 1815 (yes, 1815, not 1915) of the simple apparatus devised by Arago to demonstrate his then-daring concepts of velocity, periodicity, and difference between optical and geometrical path-lengths.

"EVA" deserves to head my list of exhibited "firsts" because it represents the first commercial embodiment of what had only been a scientific curiosity. "EVA" is the popular name given by Baird Associates to their apparatus for measuring the temperature of an object at a dis-

EDITORIAL—CONTINUED

tance by the rate at which the radiant flux from that object evaporates an oil film and thereby alters the film's color fringes.

Next "first" is likewise in the field of temperature measurement but its makers, though proud of its newness and usefulness, evidently do not—or did not—consider it a "first" because it is such a humdrum little thing in comparison with the other new products unveiled by the General Electric Co. Nevertheless I hail as an important "first" G-E's concentric thermocouple. To be sure, concentricity alone is not new: Foxboro's well-known Pyod dates back to World War One. But the Pyod is a rigid rod-like structure; and the shaping and welding of its junction is a factory job. The new concentric thermocouple is so small that it was exhibited by G-E under a magnifying glass. It comprises a 0.008″ O.D. Alumel wire in a 0.032″ O.D. Chromel tube of 0.003″ wall thickness. This couple is sheathed in a protecting tube of stainless steel or other suitable material whose O.D is 0.050″. Aluminum oxide powder is used as insulation. The sheathed assembly can be bent to a 1/16″ radius without damage. Outstanding novelty: the user can cut off the lengths he needs and make his own junctions in a few seconds—by arc welding in an inert atmosphere.

Of about forty new analytical instruments shown by about a dozen companies, the outstanding "first" was Varian Associates' nuclear magnetic resonance spectrometer. Although NMR spectrometers have been built to order by instrument companies since 1954, this is the first dual-purpose NMRS, combining a wide-line type and a high-resolution type into one instrument.

Back in 1931 there appeared the first commercial instruments utilizing capacitance variation for *continuous* measurement of moisture content, of density, of thickness of paper or rubber sheets, etc. Today they are made by some twenty or thirty companies—but to my astonishment there were two real "firsts": (1) Hygrotest Inc. showed a new combination of oscillating the capacitance-type probe across the paper or pulp web at speeds up to 135 fpm, plus automatic compensation for basis-weight, temperature, and other sources of error. These new automatic compensation methods have been embodied in a food industry installation (Spencer Kellogg) where, for the first time in history, the moisture content of a large stream of cereal product (850 tons a day) is controlled to 0.15% of the desired value which usually is 11% by weight. (2) A water-in-hydrocarbons recorder made by Foxboro whose "Dynalog" is a capacitance-balance instrument. The problem of *continuously* measuring water in crudes, etc., by means of a capacitance-variation probe was thought to be insoluble, but Shell Oil inventors devised the correct probe with the correct compensatory means, and Foxboro now sells the complete system.

The big "first" of aviation was the nearest to the ideal pocket-size automatic self-balancing potentiometer or bridge—about a fifth of the weight of the industrial control-board "miniatures." These subminiatures were developed by D. K. Warner's Flight Test instrument designers at North American Aviation and were unveiled in New York by Autonetics Div. of NAA. It usually takes them less than a fifth of a second to come to balance. Each indicator is usually connected in sequence to a number of temperature, pressure, and other primary elements.

An entirely new mode of automatic temperature control is utilized in the Leeds & Northrup "auctioneering control assembly" comprising (1) a 24-point recorder acting as a monitor, (2) a search discriminator unit, and (3) an automatic controller. The "auctioneering" behavior of this system consists in scanning all points and controlling on the hottest.

Wescon Hi Lights

MILO D. PUGH

WESTERN ELECTRONIC SHOW and CONVENTION (popularly called Wescon) was held in Los Angeles, August 21 to 24, and was attended by more than 25,000 engineers, technicians and business men.

Wescon is jointly sponsored by the San Francisco and Los Angeles sections of the Institute of Radio Engineers, representing the Seventh Region and the West Coast Electronic Manufacturers Association. Although a regional show, it has taken on the character of a national show—over 80% of the exhibitors are manufacturers with headquarters east of the Rockies.

More than 700 firms exhibited their products at the Pan Pacific Auditorium. Some 49 technical programs were held covering a wide range of subjects from Medical Electronics, Control Systems, and Automation to Earth Satellites and Computers. More than 200 papers were presented.

The new products exhibited included many new types of components, test instruments, and computers, some of which are briefly covered in the following:

Fairchild Electrotechnics Div. displayed a Resistance Bridge Indicator unit for multi-channel automatic digital

Optical Coating Laboratories, Inc. introduced a new "Dichroic Coating" which reflects one portion of the spectrum and transmits another.

G. M. Giannini & Co. displayed a new pressure scanner, a high-temperature potentiometer (200° C.) a new a-c output rate gyro, and a servo bridge computer.

Servo Corp. of America offered an infrared radiation pyrometer for measurement and control of fast-moving objects; also a thermistor heat detector useful for operations too fast, too inaccessible, too hot or too rigid for temperature indication by other means.

Librascope, Inc. showed a pressure-compensating totalizing flow computer which simplifies computations in orifice measurement of fluids. This firm also had in operation their general-purpose computer and computer components as well as an X-Y plotter and recorder and accessories.

Texas Instruments, Inc. showed the world's largest man-made crystals of germanium and silicon (see illustration); also a full line of transistors, rectifiers, and other semiconductor elements.

Hycon Mfg. Co. presented a new compact transistor power supply called the Hycon-verter, designed to replace vibrators, inverters, and dynamotors; also a new 5-inch oscilloscope and a working model of r-f scatter transmission systems.

Weston Electrical Instrument Corp. displayed the "Vamistor," a new type resistor whose resistance is not appreciably affected by temperature change (in this resistor, a metal film in spiral form is permanently bonded to the inside of a glazed vitreous porcelain tube); also a new modulating device for temperature measurement of aircraft engines.

Bourns Laboratories exhibited their new line of humidity-proof and high-temperature "Trimpots."

B-J Electronics displayed their Vibrotron Digital gages and associated digital systems.

Helipot Corp. offered "hot off the griddle" their new 5200 series potentiometer as well as improved models of their 10-turn series 7700 and 15-turn series 9500; also the "Yo-Yo" potentiometer actuated by a cord or fine wire to the pulley of the pot—when the cord is pulled, the pot shaft rotates.

Allen B. DuMont Laboratories, Inc. showed a multiplier phototube for subterraneous exploration; also (shown for the first time) the new type 352 Oscillograph-record camera.

Century Electronics & Instruments, Inc. showed the new electrophotographic recording oscillograph with 24 channels.

Burroughs Corp. showed a model of the SAGE defense system with a new electrographic high-speed 5000-character-per-second printing device (characters are formed by electrostatic charges on a surface coated paper); also a magnetic core tester for tape-wound bobbin cores.

WORLD'S
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Texas Instruments' Wescon Feature.

William Miller Instruments offered a new d-c amplifier stabilized for drift and gain over a frequency range from 0 to 30,000 cps.

Non-Linear Systems exhibited an analog-to-digital converter which counts at a speed of 400 steps per second; also a line of digital ohmmeters and digital voltmeters.

DEAR D.R.*:

Another month has rolled around in what seems like 30 minutes rather than days. We had a chance to talk to many of you at the ISA Show—but not nearly enough; that is what prompted our editorial "A New Concept" on page 1965.

For quite a while we have been bringing you masses of wonderful (in the educational sense) material on analog and digital computing techniques. By now every one of you should be an expert on simulation and digital automation! This month we call your attention to a powerful discussion in the *Simulation Council Newsletter* on Combined Analog and Digital Computation. Here you will learn how both techniques are being put to work on the same problem, combining the speed of the analog with the accuracy of the digital. You are right up at the frontier of modern instrumentation in this discussion.

Joe Hussey also tells you this month how the analog computer can be used not only to analyze your system (which we have been pleading with you to do) but also to control it. This is in the article "Process Control and the Analog Computer," beginning on page 2000.

That's an interesting figure—2000. It means that you now have received more than 2,000 pages of material so far this year in *I&A*—in fact this October issue ends on page 2134, *not counting* the 300-page Part II Handbook and Index. Are you getting your $4 worth? And wait 'till you see what's coming!

Martin, Frank and Harry tell you this month (in No. 12 of the Digital Automation series, pages 1979-1984) how to set up control programs for processes with digital techniques. The matrices may look complicated—but by now you know how simple they really are; and the trunking matrix permits even greater reduction in the number of diodes. There's a matrix in your future—so don't miss this article. It's important.

Chet Beard concludes his coverage of valve positioners this month with a discussion of positioners for cylinder operators. The growing emphasis on cylinder actuators, single-seated valves, high-speed operation, and precise control all make positioners a No.-1 subject today; and you have had No. 1 coverage of them last month and this month.

There is still a lot of show news. Hope you like our report on the ISA and Wescon shows (pages 1965-1969)—and keep your eye on the Third International Automation Exposition, New York, Nov. 26-30. This attempt to turn an entire trade show into a giant classroom has many important implications to our industry—and to all industry in general. This is your individual opportunity to get some practical application instruction on many of our editorial themes—analog computation, digital data handling and computation, servomechanisms, process control, automatic manufacturing, etc.

Hope this finds you well and happy this month. See you at the Automation Show next month.

Cordially,
Milt and the Editors

---

*Dear Reader

WHAT CAN YOU DO about AUTOMATION?

YOU have read and heard a lot about **AUTOMATION.**
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Classes will be held in conjunction with the Third International Automation Exposition, New York, N. Y., Nov. 26-30, 1956. In the mornings you attend classes; in the afternoons you monitor this giant exhibit which occupies all five floors of the New York Trade Show Building.

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BALDWIN-LIMA-HAMILTON CORP.
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THE BRISTOL COMPANY
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BROOKS ROTAMETER COMPANY
Flow measurement and control.

FISCHER & PORTER COMPANY
Equipment applications and techniques used in automatic data logging, appraisal of promising future developments.

HAMMARLUND MANUFACTURING COMPANY
COC (Centralized Operations Control) techniques, including demonstrations of systems built up from COC subsystem elements.

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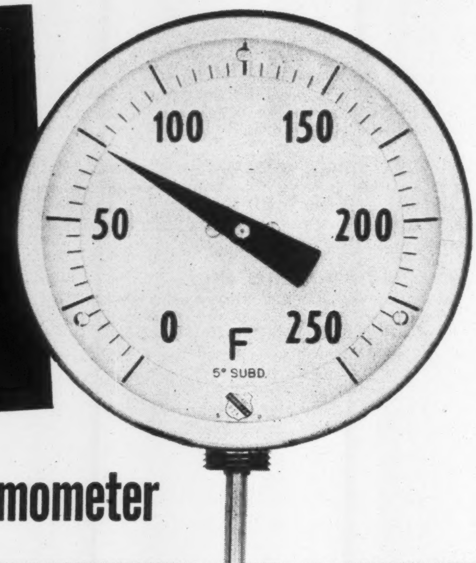

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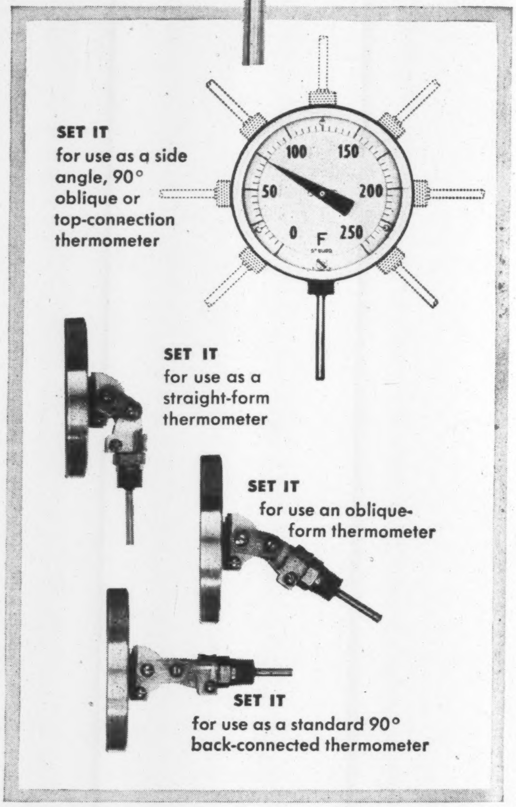

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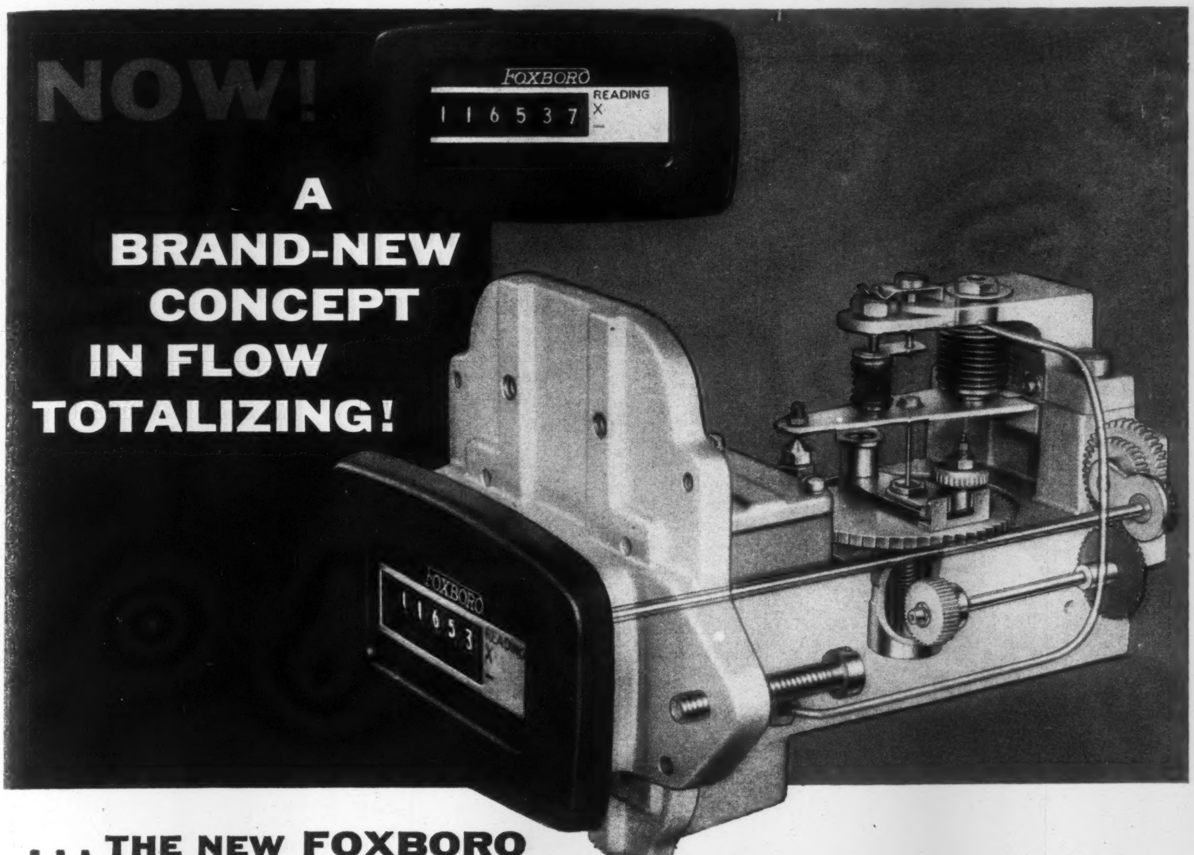

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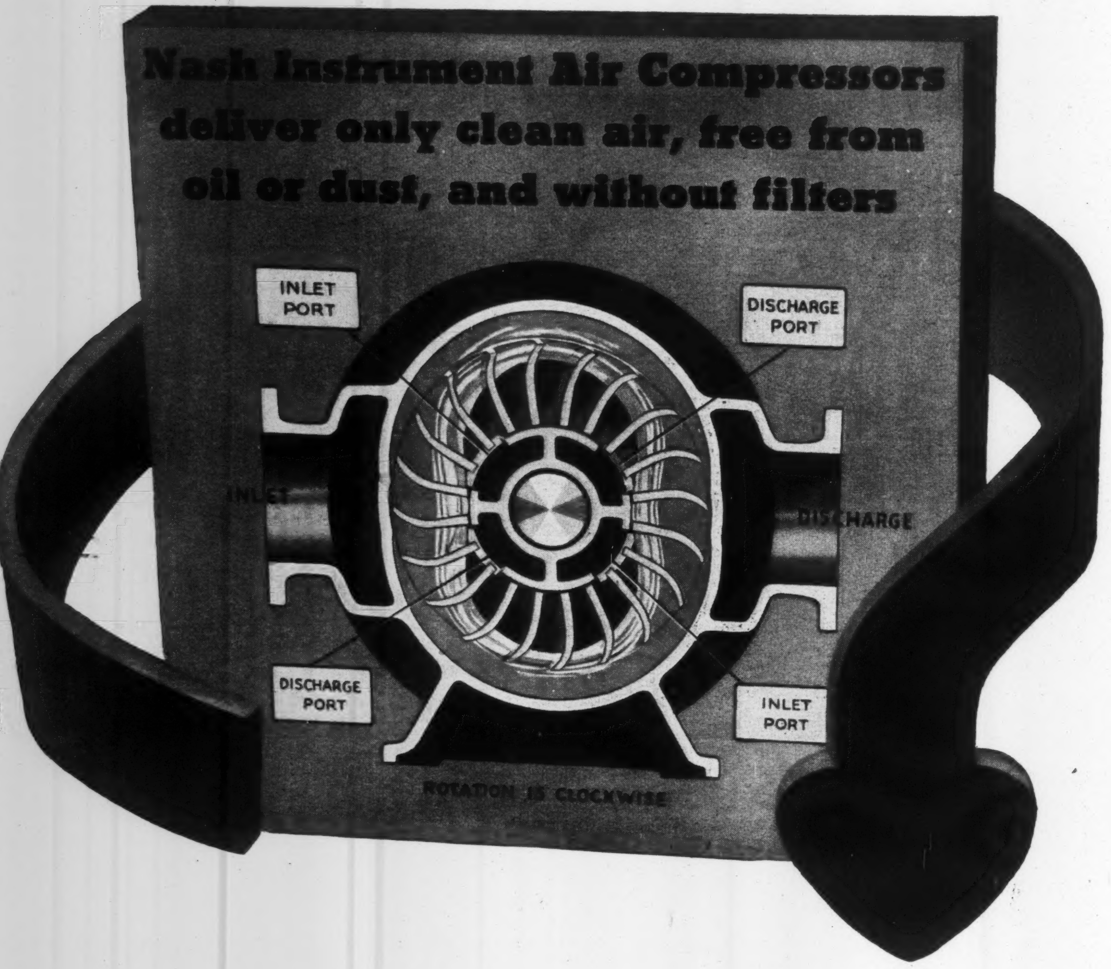
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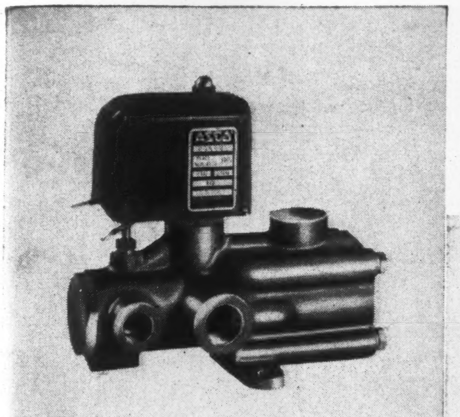
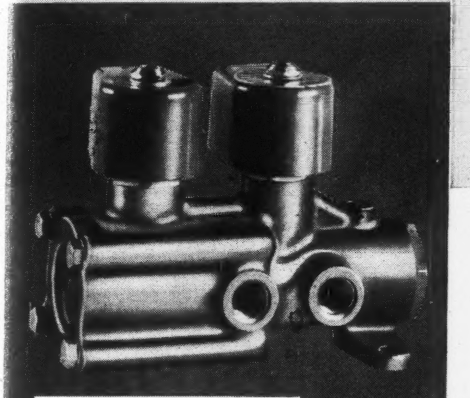
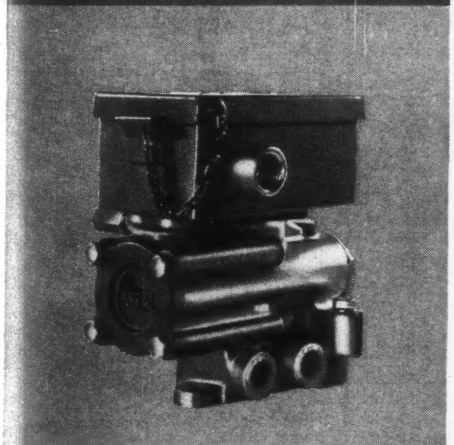


Single Solenoid: operates when solenoid is energized; returns automatically when de-energized.



Dual Solenoid: operates when either solenoid is energized; will not return until opposite solenoid is energized. Solenoids may be energized continuously or momentarily.



J.I.C. Construction: single and dual solenoids, with sub-plate mounting.

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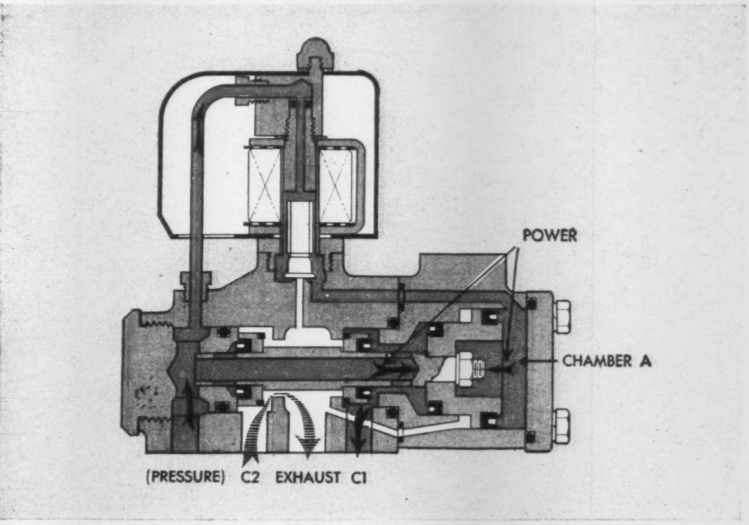

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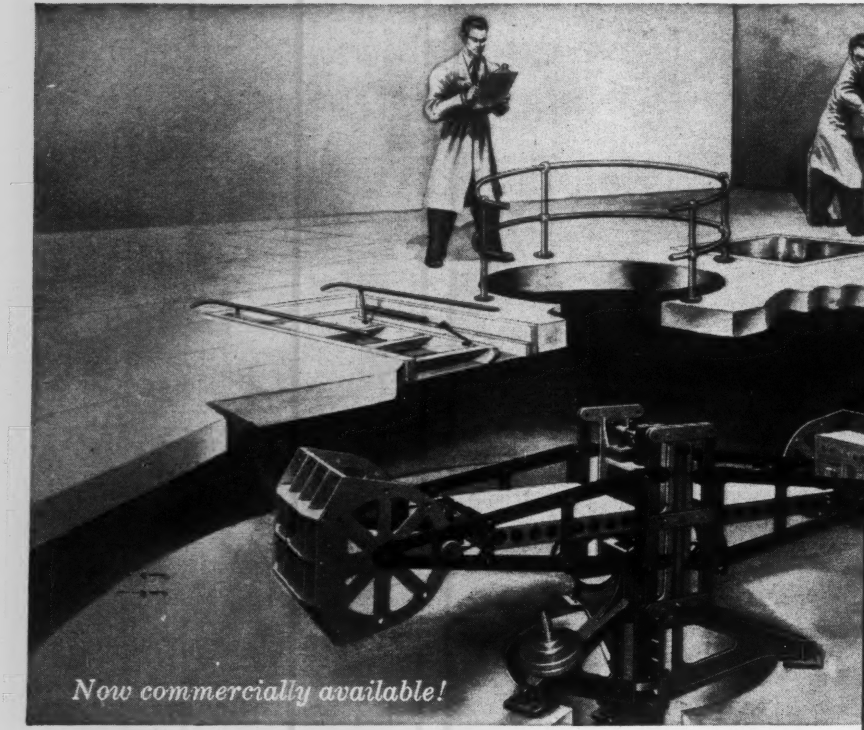
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Operation is unusually simple. Operator responsibility has been minimized, with many operational functions being accomplished automatically. Numerous built-in safety features afford maximum protection to both personnel and the machine.

These design features, plus wide flexibility in the use of the machine, reduce maintenance requirements, and together with low initial cost make the Model E the best large centrifuge currently on the market. Complete specifications will be sent on request.

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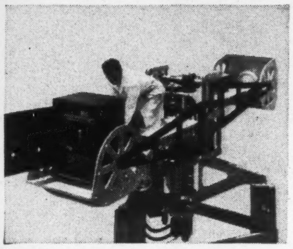
CLOSED-CIRCUIT TELEVISION SYSTEM—A closed-circuit industrial television system, incorporating a camera, control unit and remote video monitor, can be provided as auxiliary equipment for the optical surveillance of test objects under acceleration.



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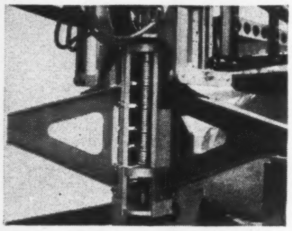
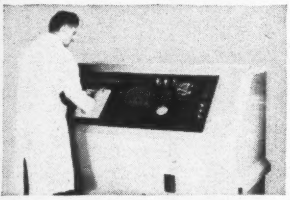


SLIP RING SYSTEM—A total of 48 slip rings are provided as standard equipment in a configuration of 24 unshielded leads rated at 14 amperes maximum, and 24 shielded leads rated at 1 ampere. Brush holders have been removed in the above photograph.



REMOTELY OPERATED—A control console permits complete operation of the rotor assembly from a remote position. All operating controls and switches are located on the console panel.

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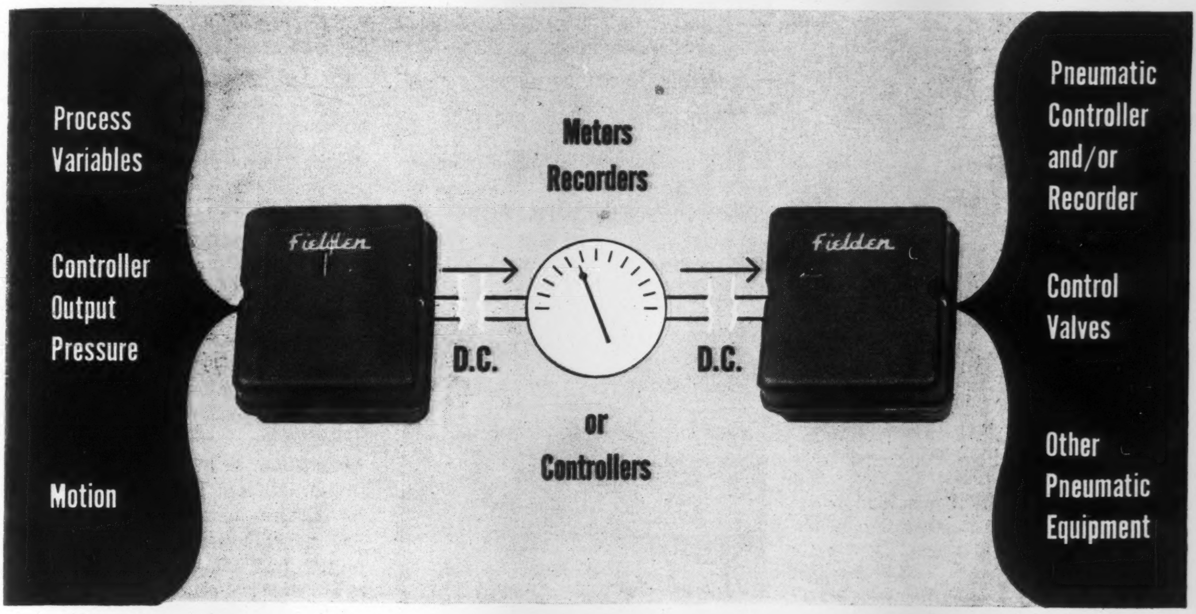
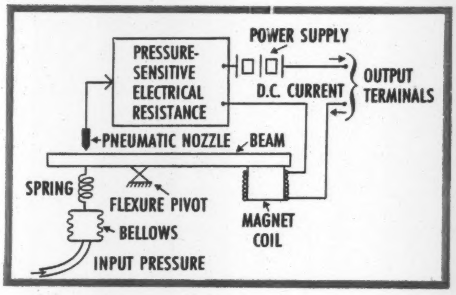
New from Fielden—A System to Convert and Transmit Any Process Variable Electrically


Process Variables
Controller Output Pressure
Motion
Fielden
Meters Recorders
D.C.
or Controllers
D.C.
Fielden
Pneumatic Controller and/or Recorder
Control Valves
Other Pneumatic Equipment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POWER SUPPLY
D.C. CURRENT
OUTPUT TERMINALS
PNEUMATIC NOZZLE
BEAM
SPRING
FLEXURE PIVOT
MAGNET COIL
BELLOWS
INPUT PRESSURE

Used with a pneumatic or mechanical transducer, the P-E-P System balances forces on a flexure mounted beam. Beam unbalance is detected by a pneumatic nozzle causing variation on a pressure-sensitive electrical resistance. This changes a rebalancing direct current which is then transmitted.

The operation of the P-E-P receiver is similar to the transmitter shown except that the transmitted current is received by a magnet coil, the pressure-sensitive resistance is replaced with a pneumatic pilot valve, and the output pressure is fed back to the bellows to rebalance the beam.

P-E-P is new from Fielden . . . the Pneumatic-Electric-Pneumatic Transmission System that converts all process variables to a direct current for simple transmission, and reconverts to a pneumatic output . . . all without vacuum tubes or complex circuitry. Its simple design assures low installed cost, dependable, fail-safe performance, instantaneous response, low maintenance. Its versatility permits remote measurement, indication, recording and control.

Fielden Modern Instrumentation at its best, the P-E-P Transmission System is different because it uses pneumatics as a simple power amplifier and error detector instead of using an electronic circuit. It takes the output of any suitable pneumatic or mechanical transducer and converts it into a DC signal of 3-15 milliamperes for transmission electrically. The receiver converts this DC signal to pneumatic pressure of 3-15 PSI for actuating control valves or other pneumatic equipment.

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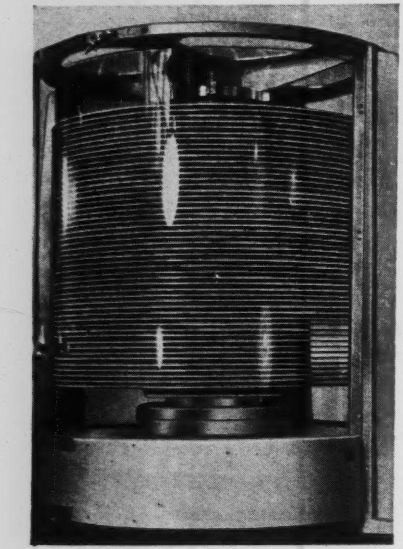
This new system promises memory storage possibilities never before accomplished. If you'd like to read more about the engineering design of this magnetic-disk, random access memory system, write for IBM Bulletin No. 400.



RAMAC's memory

Blown-up shadows

Slanting Rain

All of us have stood on a tall building on a cloudy day and looked down at the street—pretty difficult to judge relative heights of objects that far below, wasn't it? But during late afternoon on a sunny day the lengths of shadows made your estimates of height as easy as apple pie. The 100,000-volt Electron Microscope at our Poughkeepsie Research Laboratory allows us to study the topography of surfaces in just the same way. Instead of relying upon the obstruction of light by objects on a surface, we cause them to obstruct a slanting rain of metal vapor. Where the rain falls on a thin collodion coating previously put on the surface, the transmissibility of electrons through the coating is altered when it is put into the Electron Microscope; the "shadows" can be magnified and recorded on photographic film. A photographic enlargement made from the film can result in magnification of 200,000 times, thus making it possible to clearly observe an object less than one ten-millionth of an inch in diameter; or, this dash, —, magnified to the extent that it would appear to be about ¼ mile long. This magnification is about 200 times greater than practical in light microscopy, primarily because of the greater resolution possible in the EM, due to the short effective wave length of electrons.

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Digital Automation—No. 12

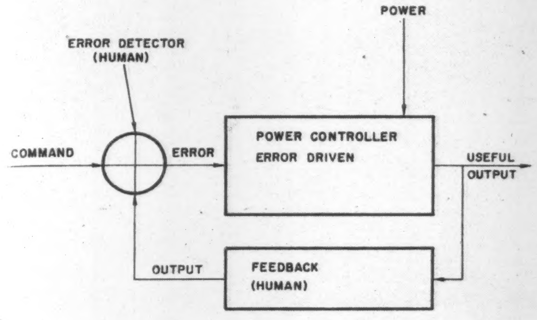

POWER
ERROR DETECTOR (HUMAN)
COMMAND
ERROR
POWER CONTROLLER ERROR DRIVEN
USEFUL OUTPUT
OUTPUT
FEEDBACK (HUMAN)

Fig. 12-1. Basic elements in a closed-loop system.

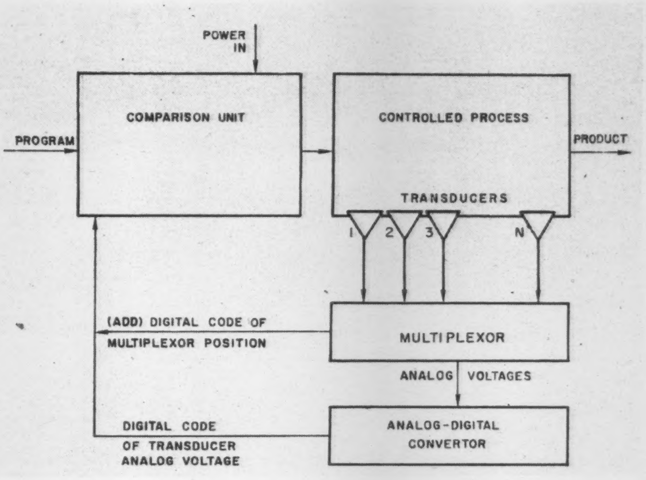

POWER IN
PROGRAM
COMPARISON UNIT
CONTROLLED PROCESS
PRODUCT
TRANSDUCERS
1
2
3
N
(ADD) DIGITAL CODE OF MULTIPLEXOR POSITION
MULTIPLEXOR
ANALOG VOLTAGES
DIGITAL CODE OF TRANSDUCER ANALOG VOLTAGE
ANALOG-DIGITAL CONVERTOR

Fig. 12-2. Digital process-control system.

Digital Process Control

The analog-to-digital converter, trunking matrix, and comparison matrix can be used to control valves at any desired level of a variable, and at any desired accuracy. Here are the principles, techniques, and design considerations for complete digital process control.

MARTIN L. KLEIN
FRANK K. WILLIAMS
HARRY C. MORGAN
Rocketdyne Div.,
North American Aviation, Inc.

ALL closed-loop automatic-control systems have several basic elements in common, as shown in Fig. 12-1. These include (1) a command or desired control point or desired control program, (2) an error detector or comparison device to detect any deviation of the controlled variable from the desired control point, and (3) a controller that makes some correction to the process in order to return it to the control point. Process control systems also use large numbers of sensing devices which indicate the state of the process in terms of each variable. That is to say, if the engineer decides that his chemical process is to take place at certain temperatures and pressures and at certain times, instruments must be provided to sense the pressures, temperatures, and time. These are the variables for the process in question.

In many processes the basic operations of comparison and correction can be performed efficiently by a human operator; hence the "error detector" and "feedback" units in Fig. 9-1 can be human or automatic. However, there are processes which are completed in thousandths of a second, or which require complicated corrective actions, or which require continuous and infallible control. Here a human operator is incapable of acting, let alone thinking and concentrating continuously about what he must do. An automatic system must be used in such cases to perform the same functions as the human operator (error detection and feedback) but to surpass the human operator in reliability, speed of response, and logical decision-making.

In summary, any process automation system must provide control for an arbitrary process involving several steps for completion, must provide for a preset program and its alternates, and must compare the state of the process with the program and take the necessary steps to complete the program. Further, this should be done at speeds in excess of human capabilities. Can this be done digitally at the present time? The answer is yes. Fig. 9-2 shows such a digital process-control system.

Converting

Most existing instruments that sense process variables provide a voltage which is an analog of the variable

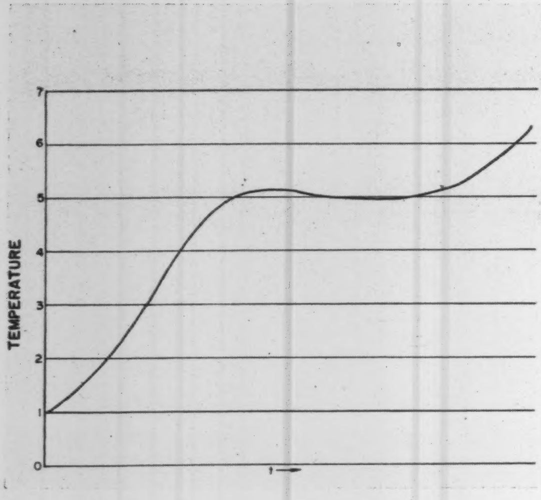


Fig. 12-3. Most commercial pickups provide an analog-type signal, such as this curve of temperature vs time.

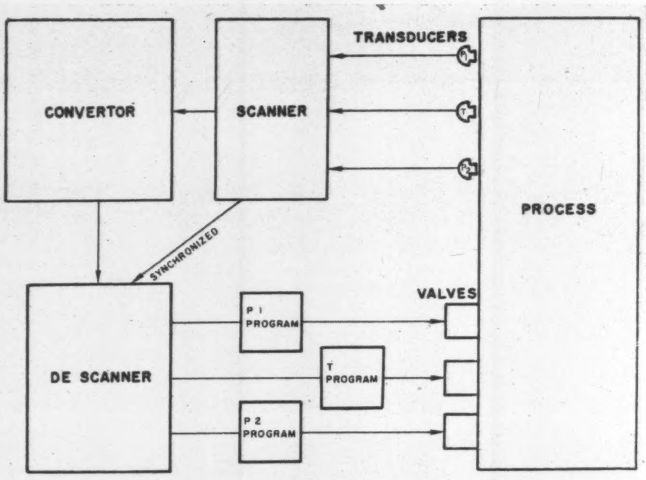


Fig 12-4. Process in which the temperature at one point and the pressure at two points are used to control three valves.

being sensed—for example, Fig. 12-3 shows a curve of temperature vs time which is produced by an instrument whose output is a voltage which is continuously proportional to the temperature being sensed. Here the voltage is an electric analog of the temperature.

The first step in using this electric analog signal is to convert it to digital form. The continuous electric analog signal is read at fixed intervals and a series of pulses is generated, each of which represents the voltage (and thus the temperature) at the instant of conversion.

The pulses generated are usually a binary code. For example, in Fig. 12-3 we have a signal which varies over a range of 0-7. Suppose we read this in binary code, allowing readings to the nearest unit (eight distinct readings). The binary numbers for the numbers 0 to 7 are:

Number	Binary Code
0	001
1	000
2	010
3	011
4	100
5	101
6	110
7	111

and if we let "1" represent a pulse and "0" no pulse, we can represent the voltage at any particular instant by a series of pulses. This can be done at any rate—at 1 or 100,000 readings every second.

A human operator can read a point on an analog curve in about two seconds. Using a conversion rate of 100,000 readings per second, we can perform the operation electronically 200,000 times as fast as a human operator. These pulses then represent the state of the process every 1/100,000 second, and the electronic reading can be made with an accuracy of 0.1%—which exceeds the accuracy of the human eye in reading an analog signal from a graph.

Multiplexing

Another unit used in the digital system of Fig. 12-2 is the *scanner*, or *multiplexer*. In a complex process we might wish to know the pressure at several places, the temperature at several other places, and other variables as well. Say we wish to know 100 different pressures and temperatures. The scanner permits these analog readings to be converted to digital code by a single analog-digital converter. The scanner works like a rotary switch, allowing first the signal from one point to pass to the converter while shutting off all others, then the next, then the third, and so on.

If we have a converter which converts to digits in 1/100,000 second, and if we have 100 information channels, we can convert each channel—with one converter—every 100/100,000 second; which is once every millisecond. This is still far faster than human capabilities. For 1 millisecond, each channel is allowed to reach the converter and is then shut off. Then the next channel is allowed to reach the converter. These scanners are essentially diode matrix circuits, as described previously. Being all-electronic, they can operate at the required high speed without difficulty. This link in the automation process of Fig. 12-2 precedes the converter.

Note that these two units are both in the feedback loop of the system. They take the state of the process readings at many points, convert them to numbers (pulses), and prepare them for the *command and comparison unit* of the system. It is clear that if we can use these numbers automatically in some method of comparison, we can control the process by giving a corrective command, automatically. These control and comparison circuits are based on logical diode networks similar to those described in Chapter 3.

Control

Suppose that these three units—converter, scanner, and comparison-command matrix—are combined to control a system automatically. As an example we will automatically control a simple chemical process in which we need to control the temperature at one point and the

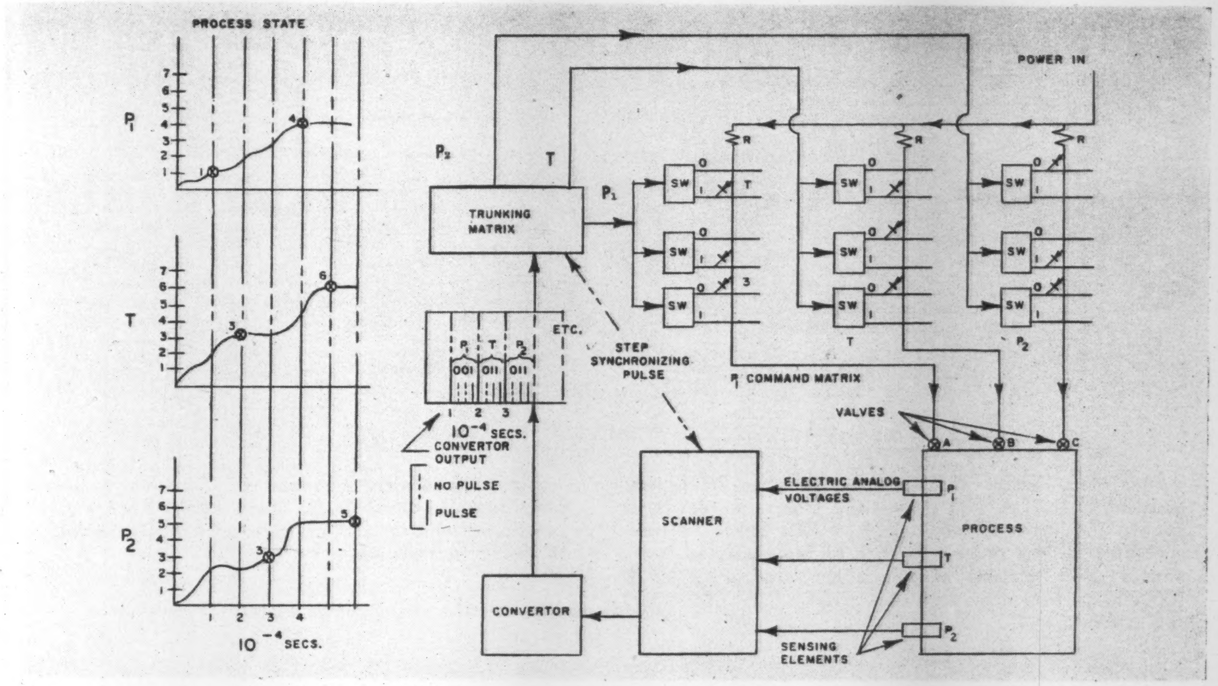


Fig. 12-5. Elements in the digitally controlled chemical process. Each variable is multiplexed in the scanner, then converted in the converter, then sent by the trunking matrix to the proper comparison matrix, each of which controls one valve.

pressure at two points, as shown in Fig. 12-4. The first step is to set up a *program* based on our knowledge of the process being controlled. Let us set down the program as follows:

Measurement	Value Required	Action to Perform
Pressure 1	4 units	Open valve A
Temperature	6 units	Open valve B
Pressure 2	5 units	Open valve C

The pressure and temperature pickups and the valves we wish to open and close are shown in Fig. 12-4. These three instruments are connected to the scanner, which reads each pickup at a rate of, say, 100,000 readings per second. Thus each of the channels is read every 3/100,000 second. At time 1, the scanner reads pressure 1 and, as shown in Fig. 12-5, the converter puts out a series of pulses which in binary code reads 001, the pressure of 1 unit as indicated on the analog trace of the instrument reading (P1) at time 1 at the left of Fig. 12-5.

These P1 pulses now pass through a de-scanner, which is another scanner that changes in step with the multiplexing scanner and channels the pulses to the correct comparison network. It can be thought of as a second rotary switch, mechanically linked to the first one, which directs the pulses into different lines. In this case the pulses are directed into the P1 comparison network set up for the pressure desired at the process point where pressure 1 is being read. In Fig. 12-5 this de-scanner is marked "trunking matrix" because such a matrix is an efficient de-scanner, as will be explained later in this discussion.

According to the program, we have set up the P1 comparison-command network so that the vertical line will be active only at 4 units—in other words, only when the switches are in position 100 (with the least significant bit at top). As the pulses directed to the SW units (switches or flip-flops) to represent number 1 are 001, the current does not pass down the line, but is short-circuited through the first and third diodes and the relay at the bottom of the line (not shown) does not close. As this relay controls the valve marked A, the valve will not open. The diodes are so placed in this vertical matrix line that the power signal will reach the bottom of the line only when the pulses 100 (representing 4) are sent by the trunking matrix to the three switches or flip flops marked SW.

The scanner now steps to the temperature-measuring instrument and, simultaneously, the de-scanner steps to the temperature-comparison network. This delivers the signal T1 to the center comparison network. The signal from the temperature-measuring device now reaches the converter and is turned into pulses 011, representing the number 3, as shown at time 2 on the temperature curve. The set of 011 pulses passes through the de-scanner to the temperature controlling network. In this network we have set the diodes so that the valve B is opened only when the number 6 (110) reaches the center comparison network. As the 011 pulses fed through represent the number 3, no current reaches the bottom of the line and value B does not open.

The scanner steps now to read pressure instrument 2, and the trunking matrix feeds the P2 signals to the P2 comparison network (at the upper right in Fig. 12-5). At time 3, the pressure from instrument 2 reads 3 units. As this comparison network has the diodes arranged to open valve C only at 5 units of pressure (101), again nothing happens.

The scanner now steps and reads pressure 1 again (3/100,000 second after the first reading was made).

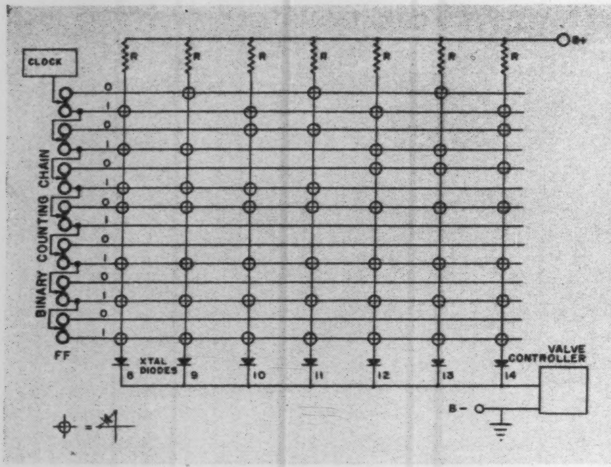


Fig. 12-6. Seven flip-flops or switches in binary counting chain (at left) permit this seven-line matrix to control the valve within 1 part in 128. Seven vertical lines have diodes placed at each of the encircled junctions so that the line at left is activated on input 8 (0001000); next line activates on input 9 (0001001), and so forth.

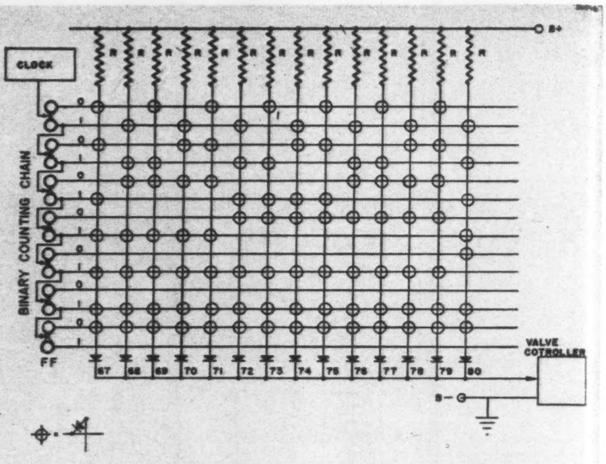


Fig. 12-7. Matrix arranged to open valve between pressure units of 67 to 80. Here again, each encircled junction represents a diode bypass from the vertical line to the horizontal line.

The de-scanning matrix also steps back to the P1 comparison network. Now the pressure read (at time 4) is seen to be 4 units (100). This time the pulses sent to the SW units in the diode network are the correct binary number; the SW units now disconnect all the diodes, permitting the current to reach the bottom of the line and open valve A. The first step has now been completed.

The scanner and de-scanner step once more, reading the temperature at time 5. The temperature now reads 6 (110) and the pulses 110 from the converter set the temperature-comparison-network switches to 6 in binary code. Now the current is no longer bypassed through any diode in this line, reaching the bottom of the line and opening valve B. On the last step of scanner and de-scanner, pressure 2 is read and the number 5 (101) is set in the switches. This allows the current to open valve C The control of this process has been completed.

Although this is a simple process, programs and alternate programs of great complexity can be constructed with little extensive modification of principle or equipment. In fact the complexity of the program is limited only by the engineer's ability to consider all possible routes he would like the program to take.

Quantitative Limits

The system described was based on a go or no-go basis. That is, a unique value was assigned to the pressure, temperature and other variables at which valve action was to take place.

Suppose that a valve is required to remain open between the values of 8 and 14 psig, within 1%. Here the operating limits become a band of values. In fact, separate operational bands could be desired so that the valve is open in the range from 8 to 14 psig and also in the range of 67 to 80 psig. Let us see how this can be accomplished with a diode matrix.

First of all, the system accuracy (and thus resolution) is 1%. In binary code operation, this suggests a 7-bit system, which has resolution of 1 part in 128, slightly better than required. Having established the required number of bits to achieve the proper resolution for the converter, we select a 7-bit converter and proceed with the matrix design.

The first band of 8-to-14 psig would require 7 vertical matrix lines, each line diode-connected (as described in Chapter 3) to represent the numbers from 8 to 14. This matrix is shown in Fig. 12-6.

With the matrix connected in common at the bottom, all values between 8 and 14 psig will actuate the valve. whereas all other values (from 1 to 127) will be grounded through one or more of the diodes and will not actuate the valve.

(In this instance the converter could be a modified chronometric type such as described in chapter 8, Fig. 8-5. The clock pulse output then is multiplexed to the flip-flop chain shown in Fig. 12-6 instead of going to the binary chain shown in Fig. 8-5 for recording purposes.)

If we wish to add the range 67 to 80 psig (that is, to have the valve remain open in the range from 67 to 80 psig), we require 14 additional vertical lines programmed is sequence to represent the numbers from 67 to 80. This is shown in Fig. 12-7. These two matrices will cover the situation and will operate over the double band of values with a resolution of better than 1%.

Scale Change

In the process problem we chose an arbitrary maximum range of 127 psig and performed control actions in the pressure bands of 8-to-14 psig and 67-to-80 psig, with a system accuracy of better than 1%. A simple change in scale factor would alter the ranges. For example, if the maximum pressure were 80 psig, and all other conditions are to remain exactly as described, the pressure of 80 psig would correspond to 127 psig, and all other values are found by using the scale factor 127/80 as follows:

8	13
14	22
67	107
80	127

In this case we would set up the matrices so that the matrix lines from 13 to 22 and 107 to 127 would be activated. We thereby control the system with 80-psig maximum pressure, as desired, to an accuracy better

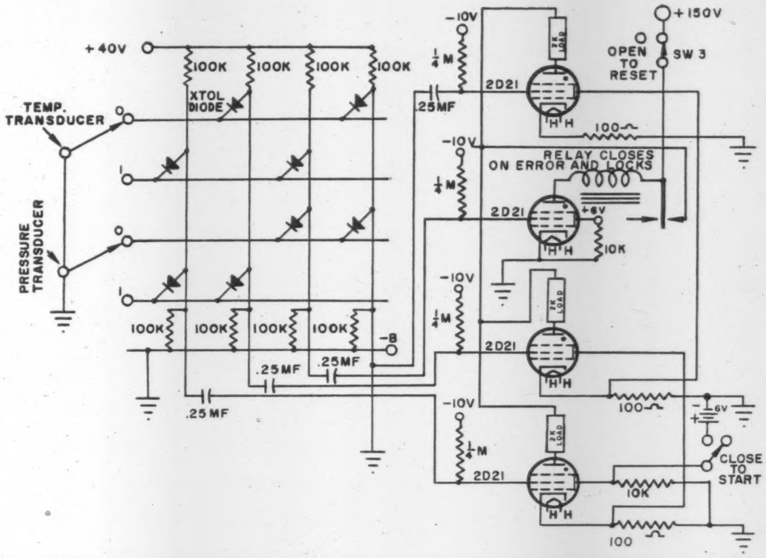


Fig. 12-8. Use of gating tubes assures proper sequence of action. Each vertical matrix line is connected to a thyratron gate tube, which cannot be fired until the preceding gate tube fires, thereby applying screen voltage to the gate tube.

than 1%, and the valves will open in the range 67-to-80 psig (lines 107-127 on the matrix) and in the range 8-to-14 psig (lines 13 to 22 on the matrix).

Determining the Number of Diodes

In general, the number of diodes required can be determined simply by multiplying the number of bits required for the system accuracy by the sum of the bands of numbers to be covered. Thus a system with a resolution of 0.1% which covers the range from 100 through 110 and 856 through 870 requires the following number of diodes:

10 bits required for 0.1% accuracy
100-110 band = 11 units
856-870 band = 15 units
Total band units = 26
26 x 10 = 260 diodes required.

It is obvious that the construction cost goes up directly with the band of values to be covered and exponentially (powers of 2) with increase of accuracy. In other words, it is more economical to design a system with less accuracy and wider operating band than one with high accuracy and narrower operating band. This assumes that the construction cost of the matrix varies directly with the number of diodes, which is generally true. Note that increasing the accuracy of the operation does not increase the number of converters used, there being only one. Therefore, although one part of the process requires 2% conversion accuracy and another part 0.1%, the converter used must be capable of digitizing with a resolution of 0.1%. In the case of the 2% readings, the residual bits can be discarded and only the most significant bits used for the comparison and control matrix.

Memory

The program to this point does not specify a specific order in which the control action is to take place. For example, in the process shown in Fig. 12-5 the temperature could reach the required value to open the valve before the pressure, or vice versa. However, it may be necessary to specify that the temperature first reach its correct value, then the pressure is to attain its correct value—but never the reverse. If something goes wrong with the process and the pressure reaches its limiting valve first, it may be desired to shut off the process. We imply here the necessity of a *memory*, which can recall what has already happened and, before performing the required logic, will see if the correct order of events has taken place in the past.

There are various techniques for accomplishing this. The simplest uses a diode matrix and a gating arrangement, as shown in Fig. 12-8. Here the transducers each operate a dp-st switch when certain desired temperature and pressure values are reached. When both are in position 0, the left vertical line goes positive and sends a positive signal to the control grid of the bottom thyratron, causing it to fire (if the start switch has been closed). The cathode of the bottom thyratron then goes 6 v positive, which enables the next thyratron, whose shield grid is connected to the bottom cathode. This second thyratron will then fire *if the temperature switch is advanced to the 1 position while the pressure switch remains at* 0. Thus a fixed sequence of pressure and temperature values must occur in proper order to obtain operation of the relays in the plate load of the thyratrons. The third vertical matrix line fires the 3rd thyratron in the event that the temperature falls again to 0 while the pressure remains at 0, indicating that something has gone wrong.

The tubes used also provide memory to keep the valve open during the interval of time the matrix is not receiving a signal. In a practical circuit, multiplexing is used, as was pointed out. This means that a signal is fed to the matrix only during the interval of time that the particular sample is being taken. Some memory is required to hold the valve open during the balance of the time. The power-handling tubes used (thyratrons) remain in a conducting state once conduction has begun. Therefore, each tube serves the double purpose of providing a gating bias for the next operation in the desired sequence and remembering for its own matrix during the time when it is not receiving a sample.

There is no limit to the steps in a sequence of events that can be incorporated in digital control of a process. The principles described can be applied directly and the problem becomes one of repeating the necessary circuits —matrices and diode connections—irrespective of the

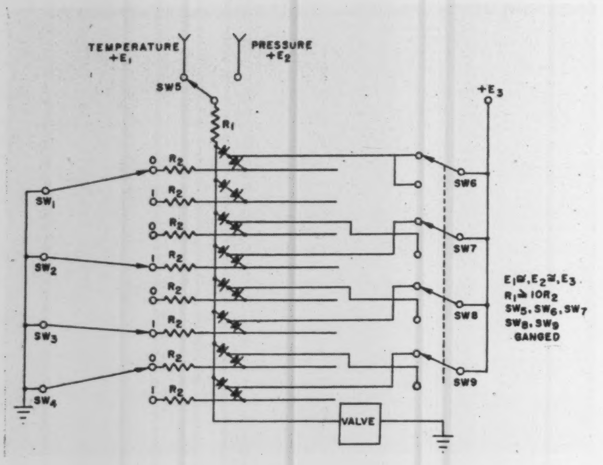


Fig. 12-9. Trunking a matrix so that it controls valve action first at 6 units (of temperature) and then at 8 units (of pressure). This is done by back-biasing the matrix diodes by switch at right. When in position shown, switch has biased diodes so that the valve is actuated (i.e. El reaches valve) when switches at left are in position 0110, as shown. When SW5-9 is thrown into bottom position, E2 reaches valve when switches at left are in 1000 position, corresponding to 8 units of pressure.

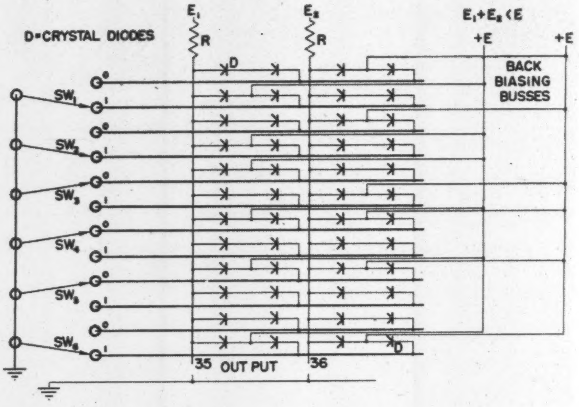


Fig. 12-10. Matrix can cover a wide range of values by back-biasing the matrix diodes. Diodes in the line at left are biased so that the line activates on input 35 (100011); next line activates on input 36 (100100).

number of steps. The engineer programming the process must have a complete quantitative knowledge of the process to be controlled, the sequence in which events are to take place, and any alternate programs he wishes the process to follow in event that the original program is not followed. Without this information no process control can be accomplished in any form—digital or any other. There are many processes which are operated today on a more or less qualitative basis. Before they can be made self-controlling, with digital or any other techniques, they must be investigated completely. It is surprising how little knowledge is available on even simple processes.

Trunking Matrices

In Chapter 3 it was pointed out that a matrix could be trunked—that is, the matrix can have its diode connections changed an any way desired. This can be accomplished by suitable back-biasing and subsidiary logical networks and becomes of high practical value when extensive programs are involved which would require many matrices, each containing many diodes.

Suppose we wish to have, simultaneously, a single matrix multiplexed (time-shared) as a comparison and logical network. That is, suppose we wish to use the matrix part of the time as a temperature-comparison matrix and part of the time as a pressure-comparison matrix. Let us say that we are working with a go, no-go arrangement again where the temperature matrix is to activate the line valve at 6 units and the pressure at 8 units. Previously we used separate matrices for the temperature and for the pressure (Fig. 12-5); we will now use a single matrix to accomplish the same thing.

Let us trunk the matrix by back-biasing the diode connections as shown in Fig. 12-9. When a diode is back-biased it is effectively disconnected; when it is not back-biased it can conduct. Here a double-diode arrangement is provided to permit the electrical back-biasing of the diodes. We arrange the biasing so that when the temperature signal (in digital form) is fed to the comparison network, the matrix is programmed to 6 units. This is done by back-biasing all of the diodes other than the ones that activate the matrix at 6 units (0110).

Previously we used a trunking matrix to distribute the various signals to the programmed matrix. This is now discarded because all of the input signals—in this case two—are to be fed to the single trunked matrix. This matrix is replaced by another which is driven by the multiplexer as before. However, each line is connected or programmed to the diodes requiring back-biasing. Thus, when the scanner is reading pressure, this back-biasing matrix connects (in parallel) to the diodes in the comparison matrix to provide a fixed level voltage, disconnecting the required diodes to make the matrix line activate at 6. As the scanner steps to pressure, this back-biasing matrix steps also to a second line which back-biases those diodes, now making the control and comparison network activate on 8.

We can now have the matrix cover a range of values, simply by extending the back-biasing connections. This is shown in Fig. 12-10, where the back-biasing lead connects simultaneously to two separate vertical lines of the comparison matrix. This programs the first martix line to the number 35 and the second to 36. This could be carried one step further by having the single line successively represent 35 and then 36, but generally this is not a practical requirement in process control.

To summarize, a process which operates in discrete operations has been detailed. It has been shown that control with accuracy of 0.1%, the practical limit at the present time, can be attained digitally. In addition, any sequence of events can be programmed. The use of a trunking matrix to perform several comparisons in multiplex was explained. All operation rests on predetermined engineering specifications which require detailed knowledge of the nature of the process.

Electron Photography

RAPID STRIDES have been made in the new field of electrophotography or electrostatic photography. Briefly, electrophotography is a method of producing a permanent image upon any surface that can be coated with a photoconductive paint. The paint has a special characteristic—it will hold an electrostatic surface charge for an indefinite time in the dark and, when exposed to light, the surface charge is grounded through the coating.

When a film negative or positive is laid over the charged surface and then exposed to light, only the light exposed areas are discharged, leaving an invisible duplicate image upon the surface composed of an electrostatic charge. The picture is made visible by applying finely ground powders with a camel's hair brush or a magnetic brush. The picture is then fixed permanently by applying heat, a coating of lacquer, or a mist coat of solvent. The entire process is accomplished in minutes.

This photoreproduction method is well suited for massive contact reproduction of full-scale original drawings, either negative or positive. It is adapted to either the pencil-line or the scribe-line method of making tooling and template layouts. It is particularly interesting for fast production of dials, nameplates, and schematics—from original line or halftone photographs, either pilot models or continuous production runs.

Applications include also photogrammetry as an accurate short-cut method for compiling maps and charts. Aircraft plants and electronic manufacturers can use it as an inplant source for check printing or original drawings, production of etched circuits, metal and plastic templates, dials and nameplates for pilot models, etc.

The process eliminates the need for developing tanks, fixing baths, water washout racks, dark room storage areas, and practically all chemicals normally used in photography. Loss from accidental exposure is eliminated and materials can be precoated and held in storage with no loss in efficiency.

(Photos by courtesy of the Truline Process Co., St. Louis 1, Mo.)

Spray coating the photo-conductive paint (ordinary shop light).

Exposing to photo-flood lamp (1 second).

▲ Developing with the magnetic brush.

▼ Fixing with lacquer or krylon.

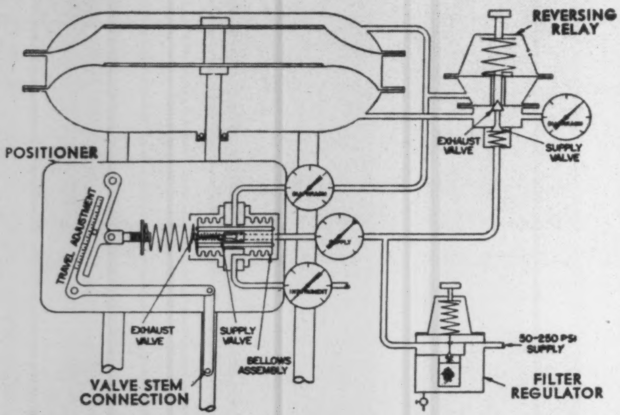

REVERSING RELAY
POSITIONER
TRAVEL ADJUSTMENT
EXHAUST VALVE
SUPPLY VALVE
EXHAUST VALVE
SUPPLY VALVE
BELLOWS ASSEMBLY
VALVE STEM CONNECTION
50-250 PSI SUPPLY
FILTER REGULATOR

Fig. 10-1. Conventional positioner for diaphragm actuator can be adapted to cylinder or double-diaphragm actuator by use of reversing relay. Reversing relay produces an inverted signal which is used on opposite side of cylinder. (Photo courtesy Fisher-Governor Co.)

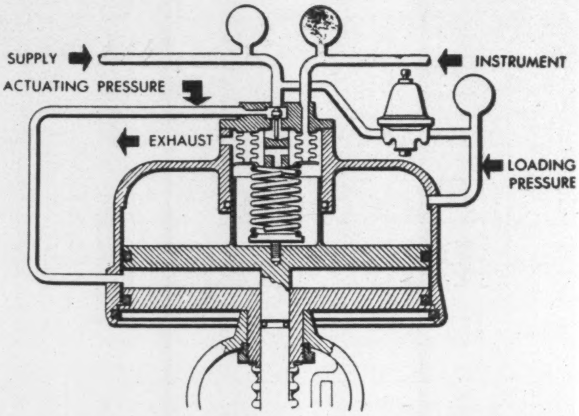

SUPPLY
INSTRUMENT
ACTUATING PRESSURE
EXHAUST
LOADING PRESSURE

Fig. 10-2. Annin "Domoter" uses a built-in force-balance positioner for a cylinder actuator with pneumatic cushioning (obtained from regulator).

Positioners for

Control Valves—No. 10

Cylinder-type valve actuators require positioners, which may be either external auxiliary devices or built into the cylinder actuator. The positioner can load either one or both sides of the cylinder. Here is a survey of the various types of integral and external positioners now available for cylinder actuators—from small built-in units to electrohydraulic units with outputs of hundreds of hydraulic horsepower.

ALTHOUGH the primary use of all the positioners described thus far is with diaphragm-actuated valves, they can be adapted to the positioning of cylinder-actuated valves. For example, the use of a reversing relay, as shown in Fig. 10-1, produces a balanced output which can be applied to the opposite sides of a cylinder or balanced-diaphragm actuator. Here the reversing relay produces an inverted signal, increasing pressure when the output of the positioner decreases, and vice versa. The two signals of opposite phase are used to operate a cylinder or double-diaphragm actuator, as shown.

A positioner can be used to operate a cylinder without the reversing relay by operating the cylinder against a cushioning volume of constant pressure, as obtained from a pressure regulator. In general, however, the positioners described thus far are for use with diaphragm-actuated valves, and the following positioners are designed primarily for cylinder actuators. (Here again there is no clear distinction—the cylinder actuators can be adapted for use with diaphragm actuators.)

Cylinder Actuators with Built-in Positioners

The following two cylinder actuators have built-in positioners—that is, the positioner-cylinder unit is offered as a package. Both use the force-balance principle, and both use pneumatic cushioning.

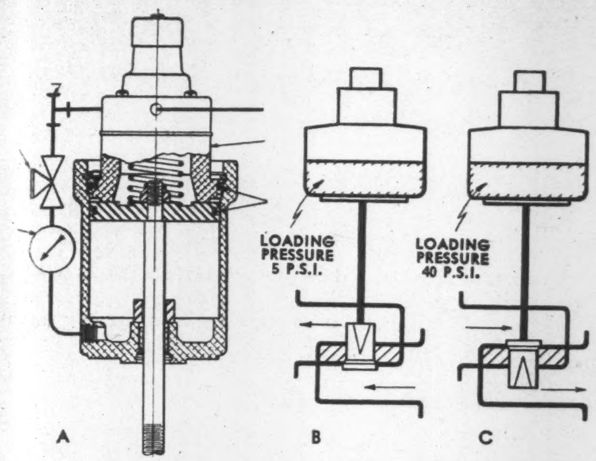


Fig. 10-3. Conoflow "Conomotor" uses a built-in force-balance positioner and cylinder operator with pneumatic cushioning (obtained from regulator). Pneumatic cushioning makes possible the handling of a wide variety of flow conditions, as shown in B and C.

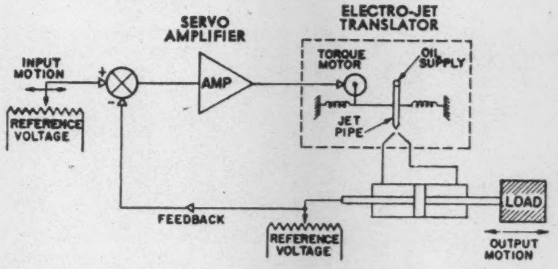


Fig. 10-4. Askania "Electro-Jet" electrohydraulic positioner accepts electrical input signal and develops output of more than 40 hp.

Cylinder Actuators

C. S. BEARD
Foster Engineering Company

The Annin Company

Fig. 10-2 shows the "Domotor" actuator, which is a cylinder actuator with built-in positioner. The force-balance principle is used. Downward force exerted by the bellows receiving the instrument signal is balanced against upward force exerted by a spring attached to the piston. Any unbalance causes the pilot valve to change the operating pressure on the bottom side of the piston. The space above the piston (dome section) is loaded by a predetermined air pressure from a regulator. Use of pneumatic pressure rather than a spring to oppose the piston motion has three advantages—(1) the piston can move through a long stroke because no room is needed for a heavy, long actuator spring, (2) stability is increased, and (3) flexibility is increased as the cushioning force is easily changed.

Conoflow Corporation

The "Conomotor" cylinder actuator (Fig. 10-3) uses a positioner similar to that shown previously in Fig. 9-11, and a cylinder actuator with pneumatic cushioning. Here again the use of pneumatic cushioning makes possible long strokes, high accuracy of positioning (within 1 part in 500), and rapid and stable response. Fig. 10-3 also shows the flexibility obtained by pneumatic rather than spring cushioning. Due to the unidirectional thrust of all single-seated valves, only a small percentage of the maximum supply pressure is needed for handling the thrust. For example, an unbalanced force of 1200 pounds due to differential pressure across the plug area can be accomodated by a loading pressure of 5 psig when the flow is as shown in "B," or by a loading pressure of 40 psig when the flow is as shown in "C." Such versatility is difficult to obtain in spring-opposed diaphragm actuators.

Positioners for External Cylinder Actuators

The preceding two positioners described are for use with pneumatically-cushioned cylinder actuators in which the pressure in the cushioning volume is held constant by a regulator.

Other types of positioners for cylinder actuators are available which adjust the pressure on *each* side of the piston, increasing the pressure on one side while decreasing it on the other side. This has the advantage of higher power positioning as the full supply pressure can be used to drive the valve either open or closed. Although the following are listed under the heading of "Positioners for External Cylinder Actuators," several of the following positioners are supplied with the cylinders as a package unit.

Askania Regulator Company

Fig. 10-4 shows the "Electro-Jet" electrohydraulic servo system, which accepts an electrical input signal and causes a proportional motion of a piston in a cylinder actuator. A feedback signal, obtained from a potentiometer attached to the piston stem is compared with the

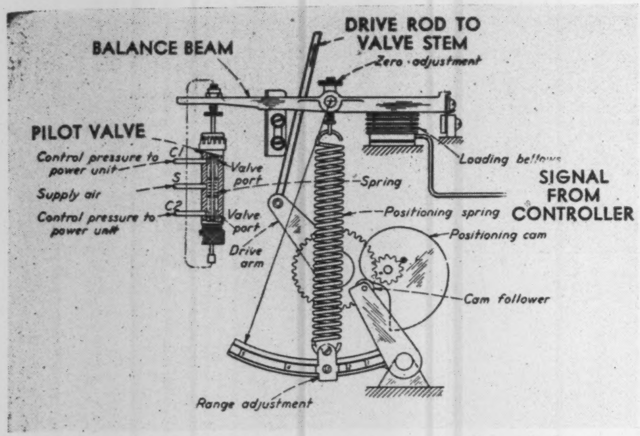

BALANCE BEAM
DRIVE ROD TO VALVE STEM
Zero adjustment
PILOT VALVE
Control pressure to power unit
C1
S
Supply air
C2
Control pressure to power unit
Valve port
Valve port
Drive arm
Spring
Loading bellows
SIGNAL FROM CONTROLLER
Positioning spring
Positioning cam
Cam follower
Range adjustment

Fig. 10-5. Bailey Meter positioner is force-balance unit with cam that characterizes the relationship between instrument signal and valve-stem position.

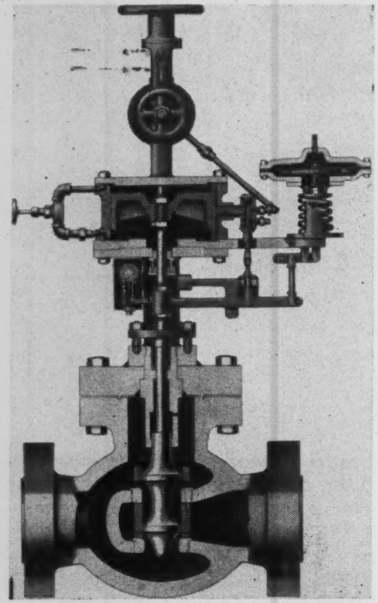


Fig. 10-6. Copes-Vulcan positioner for cylinder is of position-balance type. Pilot adjusts pressures on both sides of cylinder actuator to obtain proper positioning. Feedback to reposition pilot is via mechanical linkage.

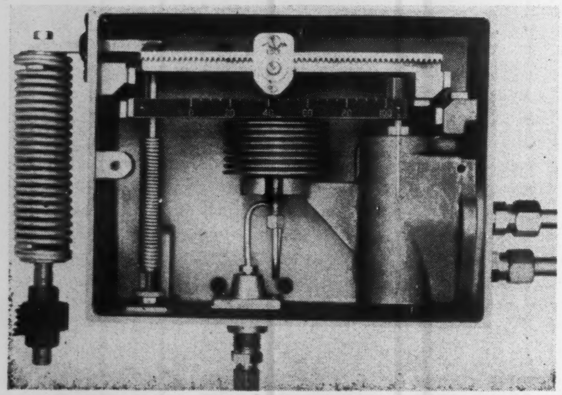


Fig. 10-7. Foxboro Power Positioner is force-balance unit for cylinder actuator. Pilot adjusts pneumatic or hydraulic pressure on both sides of piston until proper positioning is achieved, at which time the opposing forces are in balance.

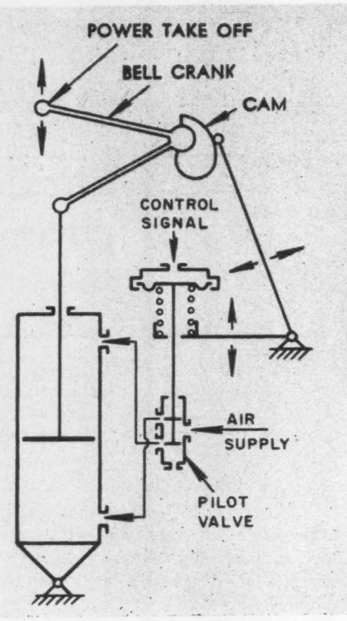

POWER TAKE OFF
BELL CRANK
CAM
CONTROL SIGNAL
AIR SUPPLY
PILOT VALVE

Fig. 10-8. Standard Hagan positioner obtains its force-balancing action via cam-transmitted return from piston. Mechanical feed-back assures proportional response.

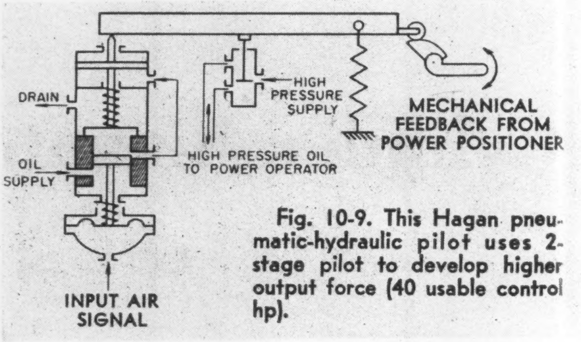

DRAIN
OIL SUPPLY
HIGH PRESSURE SUPPLY
HIGH PRESSURE OIL TO POWER OPERATOR
MECHANICAL FEEDBACK FROM POWER POSITIONER
INPUT AIR SIGNAL

Fig. 10-9. This Hagan pneumatic-hydraulic pilot uses 2-stage pilot to develop higher output force (40 usable control hp).

input signal; any difference between the two is amplified and delivered to a torque motor that positions the hydraulic jet unit. This jet delivers high-pressure hydraulic fluid to either end of the piston, which moves until the feedback signal equals the input signal.

This electrohydraulic servo can deliver an output of more than 40 hp. and positions to an accuracy of better than 0.5%.

Bailey Meter Company

The positioner shown in Fig. 10-5 is a force-balance unit with a cam that characterizes the relationship between the instrument signal and the position of the valve stem. This is done simply by a shaped cam between the drive rod for the valve stem and the positioning spring. Except for this feature the unit is a conventional force-balance positioner, with the balance beam balanced between the force exerted by the bellows receiving the instrument signal and the opposing force exerted by the positioning spring. Any unbalance causes the pilot to change the air pressure on *both sides* of the cylinder actuator with which the positioner is used.

Use of a cam to characterize the signal-position relationship in a positioner extends the usefulness of equipments such as gate valves and most plug cocks, which do not have characteristics suitable for many control purposes.

Copes-Vulcan

Fig. 10-6 shows a position-balance-type positioner with a cylinder actuator. The instrument signal is applied to the spring-opposed diaphragm unit at top right. This unit moves the pilot which admits either hydraulic or pneumatic pressure to one side of the cylinder while bleeding it from the other—until the valve stem reaches proper position. Feedback to the pilot is done mechanically by linkage.

Foxboro Power Positioner

The Power Positioner shown in Fig. 10-7 is designed for throttling-action cylinder actuators. The spring shown at the left is connected to the cylinder stem and develops a force proportional to stem displacement. This force is balanced against a force developed by the bellows which receives the instrument signal. The small spring shown within the case is a zero spring. Hence the unit is a force-balance type.

Unbalance of the forces moves a 4-way pilot which admits pneumatic pressure to one side of the cylinder being positioned while bleeding the other side. The two lines shown at the right are the supply inlet and exhaust lines; the two lines to the cylinder cannot be seen as they come out of the rear of the pilot.

Hagan Corporation

The positioner shown in Fig. 10-8 is the standard Hagan positioner, which accepts a pneumatic input signal from the instrument controller and develops a proportional pneumatic or hydraulic output signal for positioning a cylinder actuator. The 4-way pilot is force balanced between the downward force due to the diaphragm and the upward force due to the spring which is recompressed by the feedback action. A cam is used to characterize the response.

The pilot valve shown in Fig. 10-9 is a *pneumatic-hydraulic pilot* that accepts a 0-to-30-psig pneumatic input and translates it into a hydraulic fluid output for systems requiring a maximum of 2000 psig supply and flow capacities to 80 gpm. The hydraulic output can be used to control a high-power cylinder valve actuator to obtain positioning accuracy better than ¼% full stroke. Feedback from the power unit to the pilot valve is done mechanically, as shown, to obtain proportional reponse.

The *electrohydraulic pilot valve* shown in Fig. 10-10 can be used to control large cylinders in high-power actuators. It operates with a supply pressure of up to 2000 psig and is available in capacities to 600 gpm (up to 300 usable hydraulic horsepower). In addition to the high power output, positioning accuracy of 0.1% full-scale can be obtained while hysteresis is 0.05% of full stroke. The dynamic characteristics are obtained by use of (1) a permanent magnet (force) motor with d-c signal input, (2) a spinning pilot valve whose spinning motion reduces hysteresis, and (3) a 2-stage hydraulic pilot.

Republic Flow Meters Company

The positioner shown in Fig. 10-11 also has a cam that characterizes the relationship between instrument signal and valve position. Except for this feature it is a conventional force-balance positioner for use with a cylinder actuator.

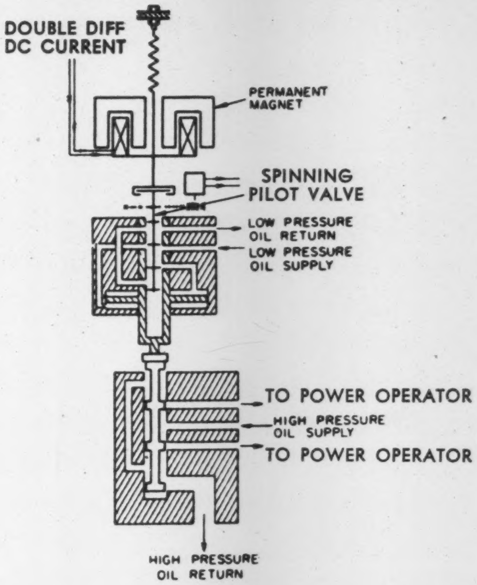


Fig. 10-10. Electrohydraulic positioner of Hagan Corporation is for high-power cylinder actuators (up to 300 hp output). Spinning pilot is used to reduce hysteresis. Electrical signal is used to position a 2-stage pilot controlling hydraulic pressure to the cylinder. Feedback from the cylinder is done via a feedback potentiometer attached to the cylinder; unless the cylinder position is as called for by the electric input signal, an amplified d-c signal is delivered to the input shown.

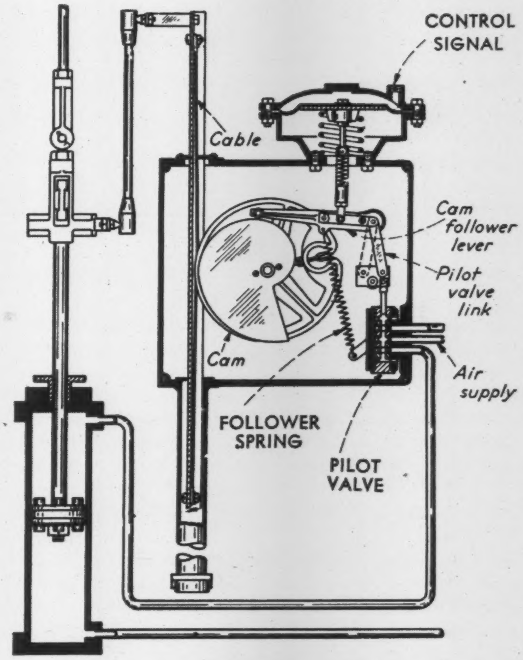


Fig. 10-11. Republic Flow Meters positioner has cam that characterizes the relationship between instrument signal and piston position.

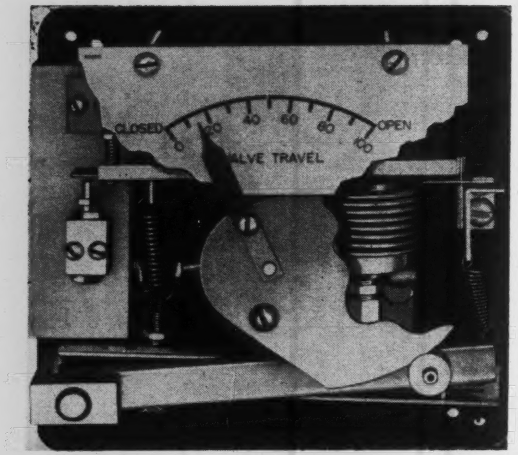


Fig. 10-12. Positioner with valve-stem-travel indicator.

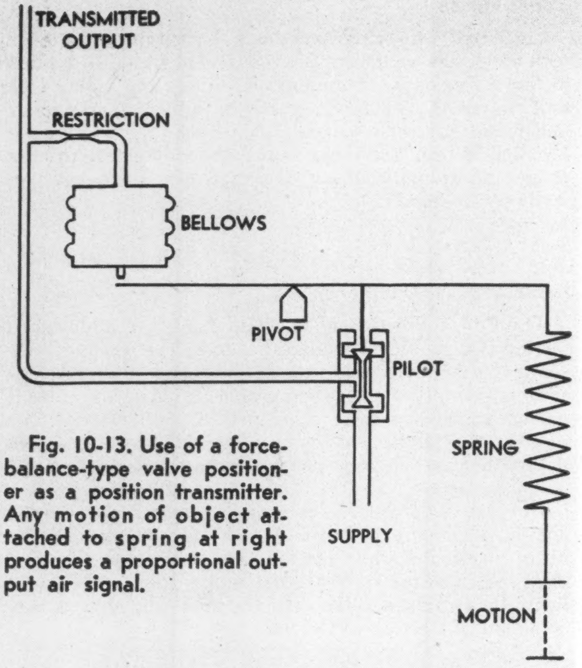


Fig. 10-13. Use of a force-balance-type valve positioner as a position transmitter. Any motion of object attached to spring at right produces a proportional output air signal.

Other Uses for Positioners

Travel Indicator

Fig. 10-12 shows a positioner equipped with an indicator that shows valve stem position.

Position Transmitter

Use of remote position indication is so useful that most firms furnish their valve positioners adapted for use as a position transmitter. Fig. 10-13 shows how the positioner is used as a position transmitter. The beam to which the pilot is attached is force balanced between two forces—one proportional to the position to be monitored, and one proportional to the output air signal. Hence any change in position of the object attached to the spring causes the pilot to produce a proportional change in output air signal, which rebalances the beam via the bellows. As the output air signal is proportional to the monitored position, the output signal can be used as a remote indication of that position.

An early application of position transmission was in conjunction with a contact plate to sense the top of the catalyst bed in the chamber of a "cat" cracker. A change in level of about 10 ft was translated through a worm gear into a vertical motion of a few inches so that it could be used as the input to a remote position indicator of the type shown in Fig. 10-13. The position indicator was calibrated to obtain a 3-to-15-psig air output with movement of the plate through its entire range.

Developing a Pulsing Valve Action

Although normal use of the positioner is to obtain stability and eliminate cycling of the control valve, the positioner can be used to do the opposite. A positioner can be re-built to cause a valve to pulse so that the flowing product will not plug the seat.

A small bellows is inserted just ahead of the nozzle. Any controller output pressure that is applied to the positioner will cause the bellows to expand and to build up pressure to the actuator. Stem movement will rapidly move the flapper away from the nozzle to retract the bellows. This pulsing effect will continue. The amplitude of the pulsation can be varied by adjustment of the stroke of the bellows; the frequency by a variable restriction in the air line to the actuator.

Snap Action for Limit Control

Instrument engineers often have to deal with systems which require two controllers—one to control one variable until the value of another variable reaches a predetermined limit, at which point the second controller takes over. Some systems use controlled output pressure from one controller as the supply pressure for the second controller; others use a limit controller, which allows the variables to fluctuate until they reach predetermined limits.

One particular installation known to the author held a constant pressure on a gas line until the flow reached a given value. The flow was to be kept below this limit. Considerable economy was possible by using two controllers, but only one diaphragm control valve. A valve positioner (Fig. 10-14) was employed as a snap-acting relay operating a three-way pilot for selection of the controller which was to operate the gas valve. If the end of the deflection beam (normally connected to the valve stem) is held rigid, the bellows will operate the pilot with a snap action. The range spring may be set at any predetermined point. This snap-acting device can be used on the output of any pneumatic controller to sound alarms or to put another instrument into service.

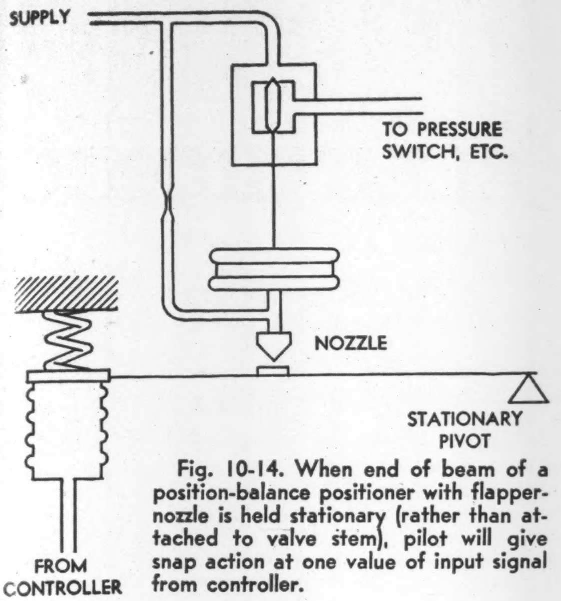


Fig. 10-14. When end of beam of a position-balance positioner with flapper-nozzle is held stationary (rather than attached to valve stem), pilot will give snap action at one value of input signal from controller.

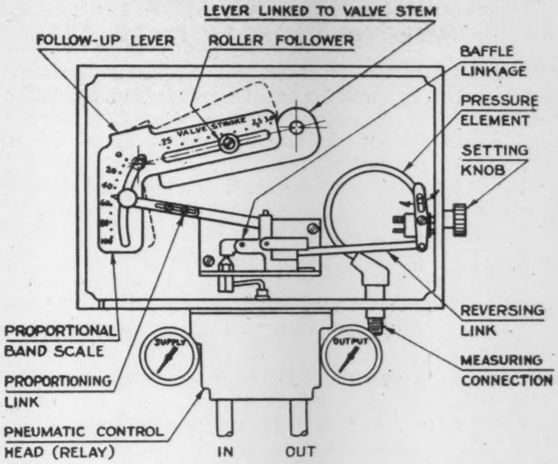


Fig. 10-15. Pressure pilot for positioning a valve is similar to position-balance-type positioner. Pilot produces output signal proportional to static line pressure measured by the Bourdon element.

Use as Pressure, Level, or Receiver Controller

Fig. 10-15 shows a pressure pilot. Like the positioner described in Fig. 9-5, it contains a flapper-nozzle unit that controls a pilot relay. The flapper is moved by the Bourdon element and is repositioned by mechanical feedback from the valve stem. Here the instrument develops a 3-to-15-psig output signal proportional to static line pressure.

The same principle is used as a level controller, a position controller, etc. This type of controller can be considered an intermediate device between self-operated regulators and full instrument-type controllers.

Evaluation of Positioner Operation

Criteria for evaluating valve positioners have not yet been standardized. The companies that have run accuracy, sensitivity, or frequency-response tests on their equipment emphasize different characteristics and, in most cases, state results in different forms.

Good design considerations include the following: (1) Valve stem movement should be linear with respect to controller output; (2) operation should be insensitive to variations in supply pressure; (3) small motion of actuator stem should cause large change in pressure to actuator; (4) air consumption should be low; (5) small cyclic changes in controller output should be dampened; (6) the pilot valve should operate on the small movement obtained through the balancing mechanism of the positioner; the pilot valve must, nevertheless, have high capacity in order to load or unload the actuator for rapid action.

Summary

Hysteresis or resistance to movement can cause a valve to lose much of its value as a flow-control element. Hence many specifications require that a control valve show evidence of movement with a change in loading on the actuator of not more than 0.1 psi. This condition is not too difficult to obtain *under test conditions.* Under *operating conditions,* however, improper packing or other factors can increase hysteresis or friction. Valve friction requiring ½ to 1 psi on the actuator to cause movement is not uncommon. One-psi change should cause 1/12 of total movement, or 8⅓% when the actuator operates in a range of 3-to-15 psig. Reference to any of the flow characteristics in Chapter 3 will show that an inaccuracy in position of 8⅓% could cause large discrepancy in desired flow rate, particularly if it occurred near the open position of an equal-percentage plug. The necessity for a comparatively large change in controller output to cause valve movement nullifies the advantages of a sensitive controller.

To minimize these adverse conditions the valve positioner was developed. It has two main characteristics: (1) *sensitive response* to changes in controller output pressure, and (2) *reproducibility* of stem position. A published response figure is 0.1% of full range. Assuming a 3-to-15-psig system, this would mean that a change of 0.015-psi will open the pilot valve of the positioner and allow full supply pressure to be applied to the actuator for moving the stem. One valve positioner will reproduce valve stem position within 0.2% of full stroke between maximum and minimum position with valve friction of 8%, which in this case is 1 psi.

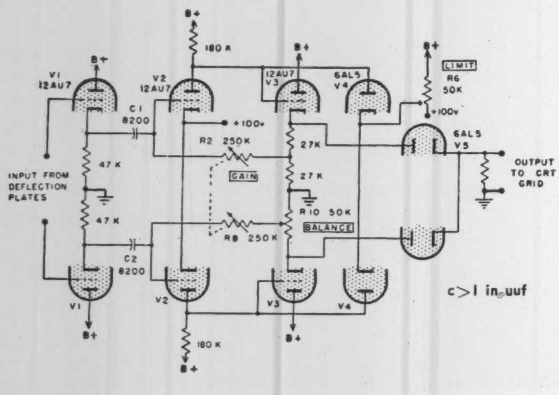
Possibilities of ingenious uses of valve positioners are limitless. The valve positioner has become indispensable in its orthodox application and insures the correct position of a diaphragm-actuated or cylinder-actuated valve under severe operating conditions. The present trend towards greater use of springless diaphragm actuators, cylinder actuators, and single-seated valves emphasizes the importance of valve positioners.

INTENSITY MODULATOR IMPROVES SCOPE PICTURES

When photographs are taken of waveforms displayed on a cathode-ray oscilloscope, the results usually suffer from marked variations in the density of the recorded trace. This is due to the fact that the faster the beam moves across the screen, the dimmer it appears to be. For example, when a square wave is photographed, the steep sides of the wave may be so lightly exposed as to be practically invisible, while the flat tops and bottoms are heavily exposed. Improved photographic techniques offer some help, but further improvement is often needed. This circuit produces striking improvement in the recorded traces, accommodating writing speeds over about a 100:1 range.

Variations in sweep speed are compensated for by applying an intensifying voltage to the cathode-ray-tube grid proportional to the magnitude of the *derivative* of the signal voltage. This correction voltage is always positive, regardless of signal derivative polarity, because brightening is needed whenever the spot is moving rapidly, whether the signal is increasing or decreasing.

Input to the circuit is taken from the cathode-ray-tube deflection plates, thus avoiding additional stages of gain and the need for changing gain when the oscilloscope gain setting is changed. The push-pull input stage (VI) is a dual cathode follower, providing low impedance output to the differentiating amplifiers V2 and V3. The cathode followers V1 also provide negligible loading on the deflection circuits because of high input impedance.



The output of V1 is differentiated in the RC circuits R2-C1 and R8-C2, to obtain outputs proportional to the vertical spot velocity. Because of the negative feedback path around stages V2 and V3, the time constants are reduced by a factor of six; the feedback amplifier also provides differentiation over a much wider range of input rates than would be available from a simple RC circuit without feedback.

The full-wave rectifier V5 selects a positive-going output from one side of the circuit or the other. If the modulator were used with a cathode-modulated CRT instead of a grid-modulated one, V5 would have to be connected to select a negative-going signal. The 6AL5 diode (V4) is a plate-catching limiter to prevent excessively large intensifying signals from being applied to the cathode-ray tube. Limiting level is adjustable by R6.

Circuit gain is adjusted by the dual 250K potentiometer R2-R8. The two sides of the circuit are balanced by adjustment of the 50K potentiometer R10 (to obtain equal intensity for positive- and negative-going signals).

ELECTRONIC

CHARLES F. KEZER
Key Electric Corp.

and

MILTON H. ARONSON
Instruments & Automation

The only modification to the oscilloscope required is addition of a crystal diode (Type CK 708) to provide d-c restoration. If this change were not made, the average trace intensity would fluctuate with the amplitude and duration of the corrective modulating voltage.

Input: Direct from deflection plates, at d-c level of about 150 v; may be capacitively coupled instead, using 5-megohm grid resistors for V1, returned to 100v.

Frequency range: 100 to 15,000 cps.

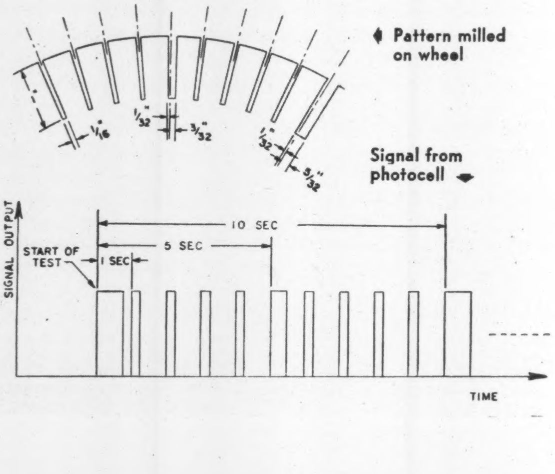
Range of writing speeds that can be accommodated: About 100:1.

B Supply: 250 v dc at 24 ma.

Source: Robert F. Kemp, School of Medicine, U. of California at LA, and Veterans Administration Hospital, Long Beach, Calif.; also *Review of Scientific Instruments*, December, 1955.

TIMING MARKER GENERATOR PRODUCES 1-, 5-, AND 10-SECOND MARKERS

Although standard millisecond and microsecond timing signals can be obtained from tuning fork circuits, crystal oscillators, WWV transmissions, etc., many tests require timing markers of seconds or more. This circuit uses a 1-rpm synchronous motor to rotate a slotted disc in front of a photocell. Disc is milled so that light falls on the photocell at 1-second intervals; every fifth slot is twice as wide to identify the 5-second intervals; every tenth slot is triple width. The relay in the plate of the



CIRCUITRY

The circuit is the heart of all electronics. Here are 3 more basic and interesting circuits. Unless marked, resistors are in ohms, capacitors in microfarads.

output thyratron is used to put marks on paper or film via solenoid pens or lamps.

A gas-filled CE-22-D phototube (similar to RMA type 1P41) is the light detector; it is triggered each time a slot passes in front of the phototube. A-c line voltage is applied directly to phototube and thyratron; hence grid of thyratron recovers control on negative swing of line voltage. Thyratron sensitivity is adjusted by 1K pot in voltage-divider network.

Selector switch in anode circuit of thyratron provides either manual or automatic starting of the timing. When on automatic, the timing starts whenever the switch to the ignitor or oxidizer valve (for rocket propellants—in which this circuit was used) was closed.

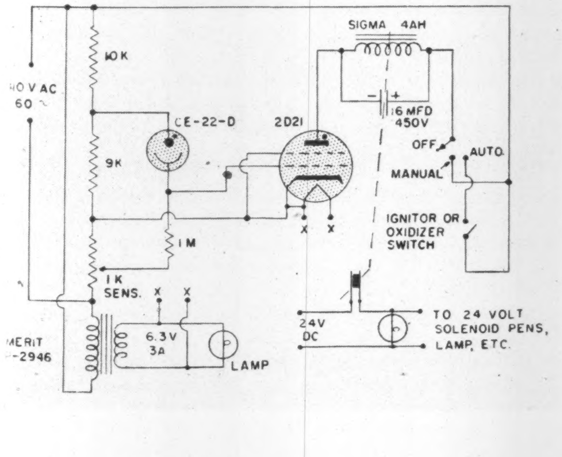
The 16-uf capacitor across the relay prevents the relay from chattering at a 60-cps rate. The thyratron fires when the grid-to-cathode voltage is above −2 volts (depending somewhat on individual tube characteristics and exact heater voltage). The 1K sensitivity potentiometer can vary the bias from 0 to −5.5 volts.

With a GE number 1120 light source (6-8 volts), the output from phototube was approximately 1.5 v. (Shield was placed over photocell-light unit.)

Output: 1 second markers of pattern shown, coded every 5 and 10 seconds.

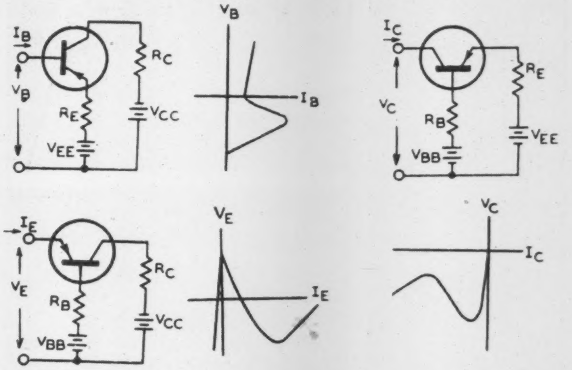
Accuracy of timing: Limited by a-c supply to 1/60 sec. Also limited by precision of milling of slots.

Source: Loren E. Bollinger, Rocket Lab., Ohio State University, Columbus 10, Ohio; also *Instruments & Automation*, July, 1956.

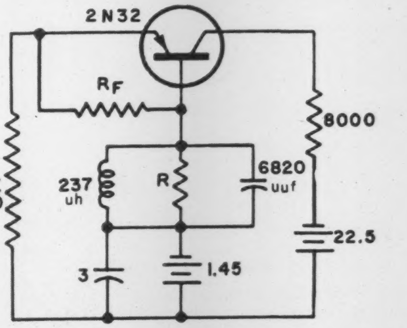


POINT-CONTACT-TRANSISTOR OSCILLATOR SHAPES BASE-INPUT CHARACTERISTIC TO IMPROVE STABILITY

As shown in the small diagrams, the characteristic (plot of voltage vs current) of either the base, emitter, or collector of a point-contact transistor has a negative-resistance region where current decreases as voltage increases. If a resonant circuit is included in the transistor circuit, and if the transistor is operated in any of these negative-resistance regions, the circuit will oscillate. The stability of the oscillation can be improved both by proper loading and by "shaping" the negative-resistance characteristic by either voltage or current feedback. The circuit shown uses voltage feedback to increase stability of oscillation; it is said to have "voltage-controlled input characteristic."



The 125-kc oscillator shown has a parallel-resonant circuit in its base circuit. Feedback resistor R_F "shapes" the input negative-resistance characteristic so that maximum stability results.



Frequency of oscillation: 125 kc.

Supplies: 22.5 and 1.45 v; currents depend on R and R_e.

Amplitude of oscillation (peak volts as measured directly):

Amplitude (*volts*)	*Load Resistor R* (*ohms*)
1.45	5,400
2.1	11,700
2.3	25,200

Stability (frequency drift in ppm/C°) with input characteristic not shaped (R_F = infinite) and shaped (R_F = 1000 ohms).

R	Drift (unshaped)	Drift (shaped)
5,400	25.0	3.5
11,700	36.0	8.8

Source: C. C. Cheng, RCA Tube Division, Harrison, N. J.; also *Proc. of IRE*, Vol. 44, No. 2, Feb., 1956.

Measurement of

F. K. PRIEBE and **H. D. TANZMAN**
Signal Corps Engineering Laboratories
Fort Monmouth, New Jersey

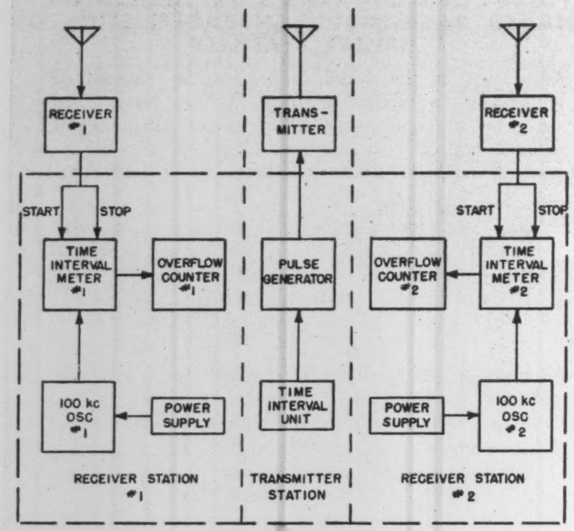

RECEIVER #1
TRANS-MITTER
RECEIVER #2
START
STOP
START
STOP
TIME INTERVAL METER #1
OVERFLOW COUNTER #1
PULSE GENERATOR
OVERFLOW COUNTER #2
TIME INTERVAL METER #2
100 kc OSC #1
POWER SUPPLY
TIME INTERVAL UNIT
POWER SUPPLY
100 kc OSC #2
RECEIVER STATION #1
TRANSMITTER STATION
RECEIVER STATION #2

Fig. 1. Block diagram of remote time synchronization system, which can measure the time difference of arrival of r-f signal at 2 widely separated stations within 0.1 microsecond.

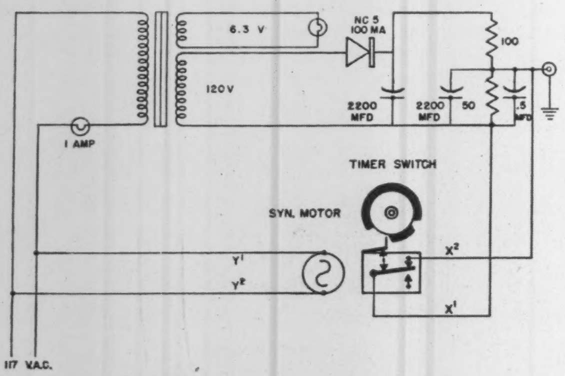

6.3 V
NC 5
100 MA
100
120V
2200 MFD
2200 MFD
50
.5 MFD
1 AMP
TIMER SWITCH
SYN. MOTOR
Y¹
Y²
X²
X¹
117 V.A.C.

Fig. 2. Interval timer (Industrial Timer, Series CM) to provide 5-minute and 10-minute intervals.

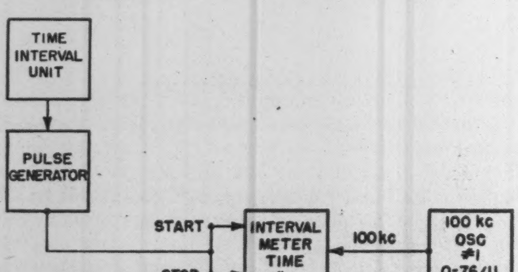

TIME INTERVAL UNIT
PULSE GENERATOR
START
STOP
INTERVAL METER TIME #1
100kc
100 kc OSC #1 0-76/U

Fig. 3. Circuit used to test repeatability of Time Interval Meter.

Table 1.—Repeatability of Time Interval Unit

Trial	TIM Reading
1	300411434.8
2	300478367.4
3	300394937.5

PRECISION time-interval measurements can be made with existing commercial equipment, such as Time Interval Meters (TIM) or Counters and Timers. However, this equipment is inadequate when it becomes necessary to measure simultaneously the time elapsed between two events at two locations that are separated by a considerable distance. For example, if it is desired that measurements be made with a precision of 0.1 microsecond at two locations separated by a distance of 30 miles, it becomes necessary to have separate oscillators of great accuracy, and this accuracy must be maintained over the period during which measurements are being made. If it is possible to check the frequency of the two oscillators every fifteen minutes (9×10^8 microseconds) and a precision of 0.1 microsecond is required, a stability of 9 parts in 10^9 is necessary because

$$9 \times 10^8 / 0.1 = 9 \times 10^9.$$

A system has been developed which makes it possible to accurately calibrate the two oscillators within 2 parts in 10^8 over a 600-second period and to obtain measurements having 0.1-microsecond accuracy.

The purpose of the timing system is to measure the time difference of the arrival of an electromagnetic signal at two separate stations to an accuracy of ± 0.1 microsecond. Basically, the system consists of two extremely accurate electronic "stop watches" (TIM's) which are started in synchronism, but stopped separately on the arrival of the signal. The difference between the readings on the TIM's is the desired time difference of arrival.

Prior to the actual timing of the electromagnetic signal, the transmitter sends a series of pulses at ten- and five-minute intervals. The pulses at the beginning and end of the ten-minute interval start and stop, respectively, the TIM at each receiving station. Since both TIM's have operated for the same interval of time, they should display the same reading. However, since each TIM is operated from a separate oscillator (0-76/U), the readings will probably be different. This difference is recorded and used as a correction factor in determining the time difference of arrival. Fig. 1 is a block diagram of the complete system.

Since the stations are separated by approximately 30 miles, it is not possible to operate the two stations from the same oscillator. Therefore, separate oscillators must be used, and the oscillators should not change more than 3.0 parts in 10^9 per second for a 5-minute period (300 usec/0.1 usec). These oscillators should not be calibrated at intervals of less than five minutes because the change is very small for shorter intervals and would be difficult to detect with existing time interval meters. However, if the repetition rate of the measurements is increased, the accuracy required decreases.

SHORT TIME INTERVALS

Problem: How to measure time difference of arrival of r-f signals at two widely separated stations within 0.1 microsecond? Solution: Two time-interval-measurement systems whose counting oscillators are checked at 10-minute intervals. The instrumentation and check procedures are described in detail.

R-F Oscillator, 0-76/U

The source of the precise 100-kc signal in the time measuring system is the crystal-controlled oscillator, which consists of a "GT-cut" temperature-controlled quartz crystal, a driving amplifier for the crystal, an isolating amplifier and a heater oscillator. The oscillator will maintain its frequency to within one part in 10^8 per day (100,000 ± 0.001 cps).

Time Interval Meters

The time interval meters used are modified Hewlett-Packard 524B Frequency Counters and Hewlett-Packard 526B Time Interval Units.

The Model 524B is a precision instrument that automatically measures frequencies to 10 Mc/s and automatically displays its answer in digital form on an eight-place panel indicating system. In addition to making direct measurements of frequency, the Model 524B, when used with Model 526B Time Interval Unit, permits measurements of time intervals from 0.1 microsecond to 10^7 seconds.

Separate "start" and "stop" input channels and their special threshold-selecting controls are contained in the Time Interval Unit.

In the final system, it is desirable that the TIM is disabled so that the display cannot be altered. This is done by modifying the gate section so that the signal gate tube, gate control tube, and the display thyratron will not receive plate voltage when the TIM gate is closed, which then makes it impossible for the TIM to reset or change the displayed reading.

Overflow Counter

The overflow counter consists of three Berkeley Decimal Counting Units, which are direct-reading plug-in electronic counters whose total capacity is 999 pulses, and which resets to 000 on the 1000th pulse.

Pulse Generator

The Teletronics Model PG-200A Pulse Generator is a medium power, precision instrument for generating rectangular waveforms having fast rise and decay time. Wide ranges of pulse duration, amplitude, and recurrance rate are provided. It may be operated self-synchronously or be driven by an external signal of almost any waveform. In either case, it can furnish a fast trigger for synchronizing auxiliary equipment.

Table 2.—HP 524B Comparison Test

No. 1	No. 2	No. 3	No. 4	Time Between Start and Stop Pulses in Seconds	Discrepancy in Counts
88778595	88778596	88778596	88778596	1	1
10035395	10035396	10035396	10035396	100	1
06930184	06930185	06930186	06930186	500	2
22359388	22359389	22359389	22359390	1000	2
96391581	96391582	96391583	96391582	9990	2

Industrial Timer, Series CM

A timer (Fig. 2) was assembled in order to meet the requirements for providing the following time sequences:

Counting time:	10 minutes
Reset and "off" time:	5 "
Counting time:	10 "

A synchronous motor-driven cam actuates a Microswitch at the end of 5- and 10-minute intervals. The switch, when closed, shorts out a 50-ohm resistor. The short across the resistor triggers the pulse generator; the capacitor prevents arcing so that malfunctioning of the pulse generator due to multiple pulses does not occur.

Repeatability Test of Time Interval Unit

Fig. 3 is a block diagram indicating the circuit used in this test. The time interval unit generates pulses which "start" and "stop" the TIM. The period that the TIM is on depends on the time interval unit. The precision of the time interval unit is better than 1 part in 300, which is adequate for the purpose of establishing the 5-minute and 10-minute basic intervals. Table 1 indicates the repeatability of this time interval unit.

Test of Time Interval Meters

During all tests made it was found that all HP Type 524B TIM's operated well within the required limits. At no time did errors occur that could be traced to the TIM's. A series of tests were designed to ascertain the reliability of the TIM's. Fig. 4 is a block diagram of this test system. Table 2 shows the performance of all four TIM's when operated from one Oscillator 0-76/U as the external 100-kc standard. The "start" and "stop" gates were operated manually.

Test of 100-kc Oscillators

The 100-kc oscillators were connected as in Fig. 5, and aged for thirty days. This system allows for a continuous recording of the beat note resulting from heating the reference standard against a 100-kc oscillator. During the aging period, the frequencies of all the oscillators were periodically adjusted to zero beat with the standard. The heater control resistors in the coarse thermostat circuit were constantly adjusted to keep the reading on the heater current meter at center scale. As a reference

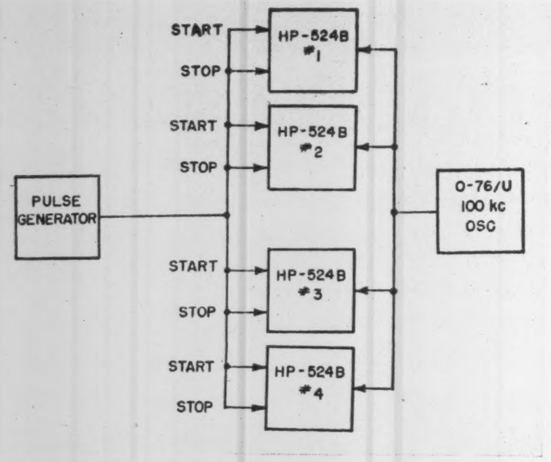


Fig. 4. Block diagram of comparison test circuit for testing HP 524B Time Interval Meters.

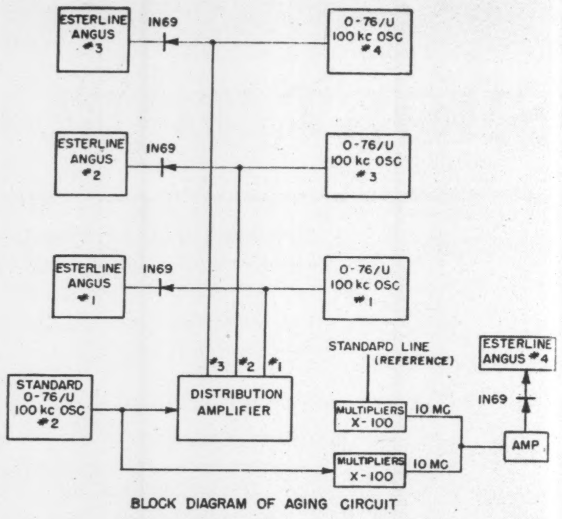


Fig. 5. Beat rate between standard oscillator (lower left) and other 100-kc oscillators is recorded to test oscillators for drift.

standard for this test, the master oscillator feeding the 100-kc line throughout the laboratories was used. This oscillator has been aged for over 3 years; therefore, its drift rate is very low.

At the end of the aging period a test circuit, as shown in Fig. 6, was set up. One oscillator was connected to a precision time interval unit, which generates one pulse every 1000 seconds, and the output of this unit was used to start and stop the time interval meter. The second oscillator was used to supply the 100 kc necessary for the operation of the meter. The two oscillators were set to the exact frequency at the beginning of the test. If the oscillator which starts and stops the TIM decreases in frequency, the reading on the TIM increases. This information was plotted and indicated the relation between the two oscillators; a relative drift rate of 10 parts in 10^8 per hour was thus indicated.

Final Test

The final test circuit, which simulates the actual operating conditions, is shown in Fig. 7. The circuit operates in the following manner: The Pulse Generator PG-200A is triggered from a precision time-interval generator and feeds a pulse to start TIM's 1, 2, and 3.

After starting TIM's 1, 2, and 3, switches S_1 and S_2 are closed. The succeeding signal pulse from the precision time base generator triggers the pulse generator again; this pulse stops TIM's 1 and 2 and starts TIM 4. This same pulse is delayed by a pulse-delay generator and stops TIM's 3 and 4 after a delay of Δt.

Note that two individual Time Interval Measuring Systems are used in the final test. Time Interval Meter 1 is started and stopped by two successive pulses and constitutes, with its Oscillator 0-76/U, an independent system. TIM 3 is started by a pulse and stopped by a second pulse delayed by the delaying network. It has its own Oscillator 0-76/U and therefore represents a second Time Interval Measuring System which, except for the starting circuit, is independent of the first one.

Assume that the two Time Interval Measuring Systems have been started by a calibration pulse; then any following pulse will stop both systems at different times, depending on the delay.

Comparing Fig. 1 with Fig. 8, it is seen that TIM 3 plus the delay in Fig. 8 is equivalent to Receiver Station 1 in Fig. 1. (The delay in Fig. 1 is represented by the transmission medium). In Fig. 8, TIM 1 is the same as Receiver Station 2 in Fig. 1 if it is located at the transmitter.

The difference in readings between TIM 1 and TIM 2 is due to the relative difference in oscillator frequency.

The difference between TIM 1 and TIM 3 in Fig. 8 is the difference between TIM 1 and TIM 2 plus the delay. The final performance data are listed in Table 3.

TIM 1 plus TIM 4 should equal TIM 3. Table 3 shows that it does within 0.2, which is entirely permissible, since one TIM can be 0.1 high and the other 0.1 low.

In the arrangement in Fig. 1, calibrations of the oscillators can be made prior to and following actual time measurements by the transmission of precise pulses derived from a reference oscillator and transmitted by the transmitter located in the center of Fig. 1. During the actual time measurement, Receivers 1 and 2 in Fig. 1 are tuned to a frequency that is different from the calibration frequency and no calibration is obtained during the actual measurement. A correction can be used for the actual measurement based on the readings of TIM 1 and TIM 2 just prior to the actual time measurement (as determined by the calibration before the measurement).

Table 3.—Final Performance Test Data

Trial No.	Time 1 (usec)	Time 2 (usec)	Time 3 (usec)	Delay Time 4 (usec)	3—2 (usec)	Correction (A) 2—1
1	1000124050.0	1000124081.4	1000124198.1	116.9	116.7	31.4
2	1000008237.0	1000008269.1	1000008386.0	116.9	116.9	32.1
3	1000001865.0	1000001998.0	1000002114.7	116.9	116.7	33.0
4	1000001929.2	1000001961.6	1000002078.3	116.8	116.7	32.4
5	1000001991.1	1000002023.7	1000002166.9	116.9	116.8	32.6
6	1000002017.2	1000002050.1	1000002191.2	116.9	116.8	32.9
7	1000001963.7	1000002074.4	1000002191.2	116.9	116.8	110.7

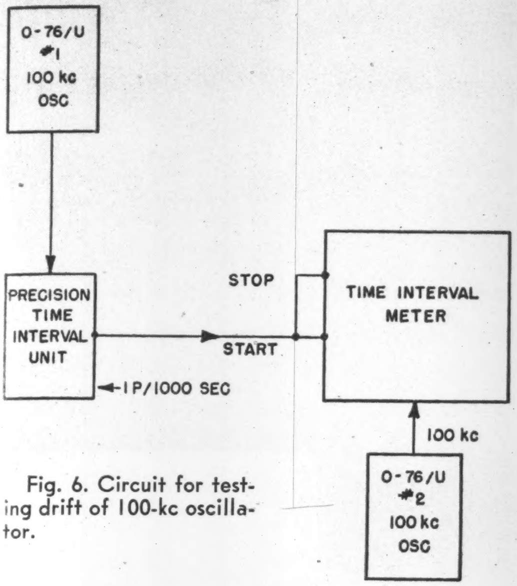

0-76/U
#1
100 kc
OSC
PRECISION TIME INTERVAL UNIT
STOP
START
TIME INTERVAL METER
1 P/1000 SEC
100 kc
0-76/U
#2
100 kc
OSC

Fig. 6. Circuit for testing drift of 100-kc oscillator.

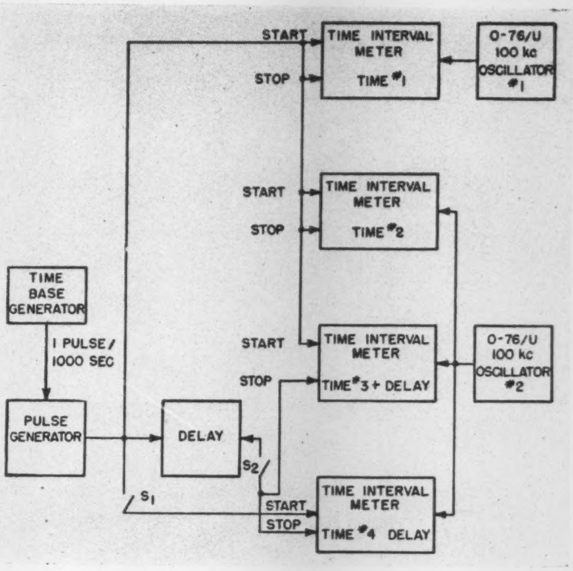

START
STOP
TIME INTERVAL METER
TIME #1
0-76/U
100 kc
OSCILLATOR
#1
START
STOP
TIME INTERVAL METER
TIME #2
TIME BASE GENERATOR
1 PULSE/
1000 SEC
START
STOP
TIME INTERVAL METER
TIME #3 + DELAY
0-76/U
100 kc
OSCILLATOR
#2
PULSE GENERATOR
DELAY
S2
S1
START
STOP
TIME INTERVAL METER
TIME #4 DELAY

Fig. 7. Block diagram of final test circuit.

Another correction may also be used based on the relative difference of the intervals as determined by the system shown in Fig. 8.

Fig. 8 and Table 3 show a portion of the results of the final test for a 24-hour period. Readings were taken at 2000-sec intervals. The effect of the random variations has been eliminated by forming the best estimate of the average line in accordance with statistical procedures.

Also shown in Fig. 8 are two boundaries which represent the 90% confidence limits. These confidence limits indicate the range of variation and the best statistical estimate the average line can have in order that no more than 10% of the points fall outside these limits.

Fig. 8 and Table 3 show four extremely high values for the difference between the readings of TIM's 1 and 2. These values, ranging from 51.2 to 129.1 are obviously in error. Since the difference between TIM 3 and TIM 2 is normal, the error has to be either with TIM 1 or Oscillator 0-76/U, No. 1.

Later it was determined that the error in readings was due to noise superimposed on the signal.

Conclusions

The final test reveals two groups of errors; one which is extremely large (129.1 usec max) and one comparatively small (2.8 usec max). The large error is caused by faulty triggering of the TIM. The smaller error is due to erratic operation of Oscillator 0-76/U, which changes suddenly due to variations in plate, heater and filament voltages. The control circuits for the heaters were also a source of trouble. Many users of the Oscillator 0-76/U have modified their units to eliminate these sources of trouble.

Subsequent investigations revealed that at least one oscillator has been produced which is superior in many respects to Oscillator 0-76/U. The unit referred to was developed by the Radio Laboratories of the British Post Office.

The present rate of count for Time Interval Meters is 10 Mc/s. Evidence exists that it is entirely possible to design and construct a high-speed TIM that will operate at a rate of 100 Mc/s. The use of an oscillator with a stability of one part in 10^{10} and a time interval meter with a counting rate of 100 Mc/s could greatly increase the accuracy of the time interval measurements.

The system as described worked satisfactorally for a period of several weeks.

Acknowledgments

The authors wish to express their appreciation to Dr. G. K. Guttwein for his valuable suggestions concerning this report and for his advice in consultations during the development of the system. Gratitude is also extended to Messrs. Charles Miller and William Scott.

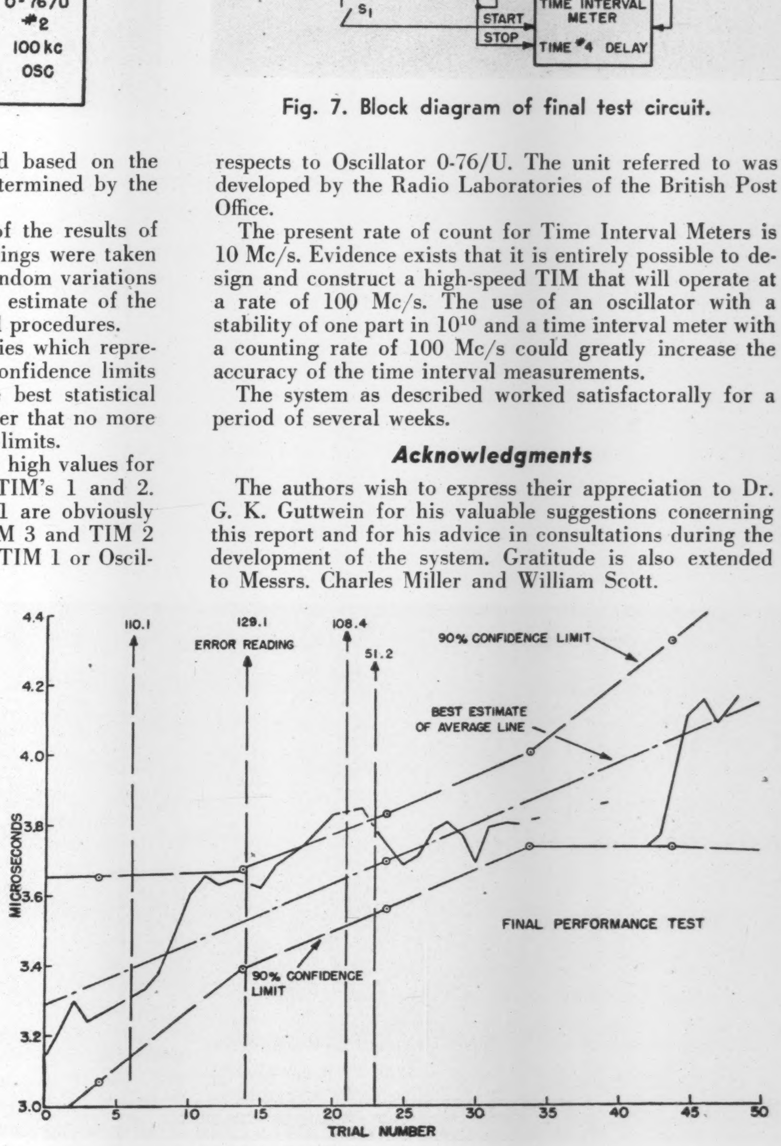


Fig. 8. Final performance test.

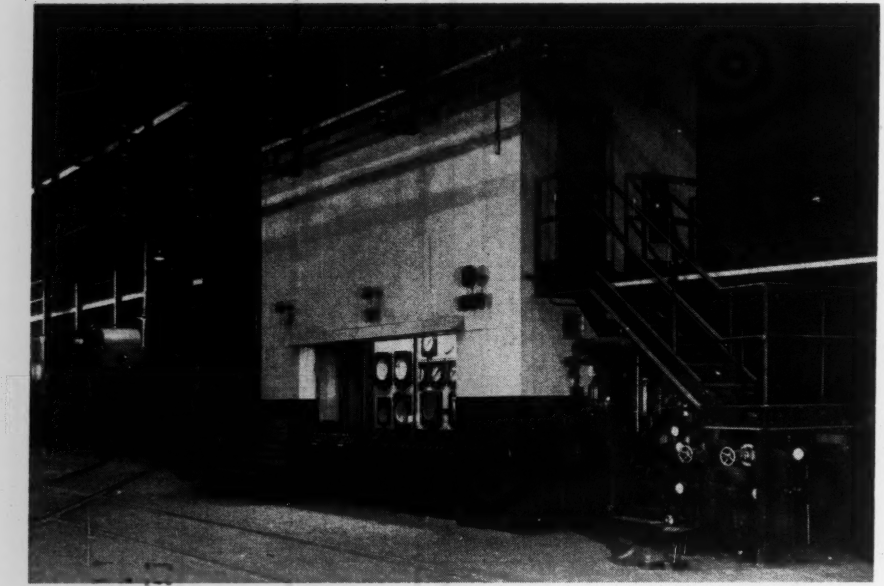


Fig. 1. Two-story control house for one open-hearth furnace. The top room houses all the electrical controls for furnace doors, reversing valves, slag buggies, etc. The first floor houses the control panel and most of the combustion mechanism which is located at the rear of the panel board. Both rooms are steam heated and pressurized to keep dust infiltration at a minimum.

Iron & Steel ⇄

YOU met Bob Lambert, Superintendent of the Steam Efficiency and Combustion Dept., J&L Pittsburgh Works Division, on page 1947. Here are typical instrument activities at his plant. His instrument Repairmen attend courses on instrumentation conducted by Hagan, Leeds & Northrup, Askania, and Foxboro. Classes are also held by the Jones & Laughlin Steel Corporation in conjunction with the Mineral Industries Extension Services of the Pennsylvania State University, covering Combustion and Instrumentation.

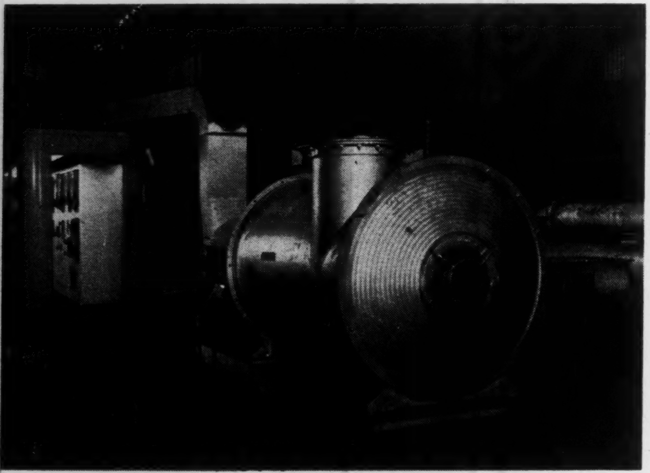


Fig. 2. A control house for one bank of four soaking pits has a blower which is used to pressurize the control house through ceiling ducts to keep dust infiltration to a minimum. One of three combustion air blowers is shown in foreground.

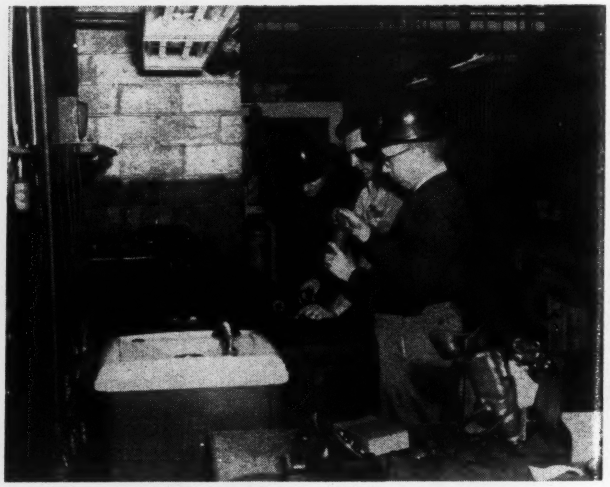


Fig. 3. An improved open-hearth bath thermocouple which was designed and constructed by the Combustion Division personnel.

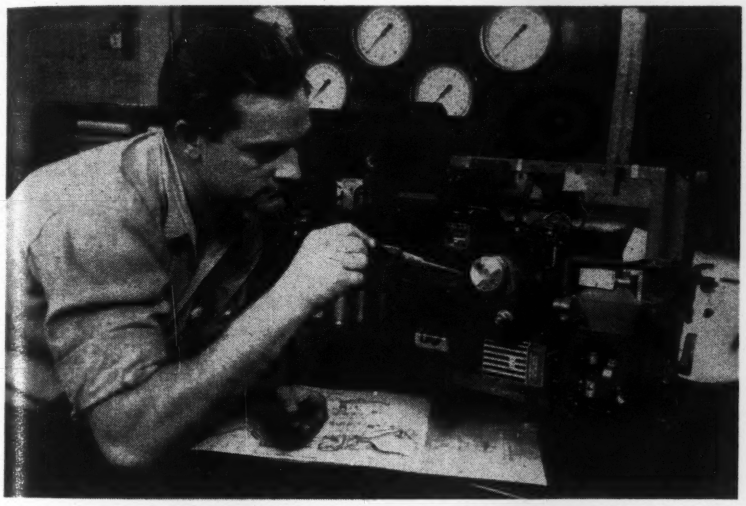


Fig. 4. Instrument Repairman adjusts a temperature recorder controller in the Instrument Repair Shop.

Instrumentation

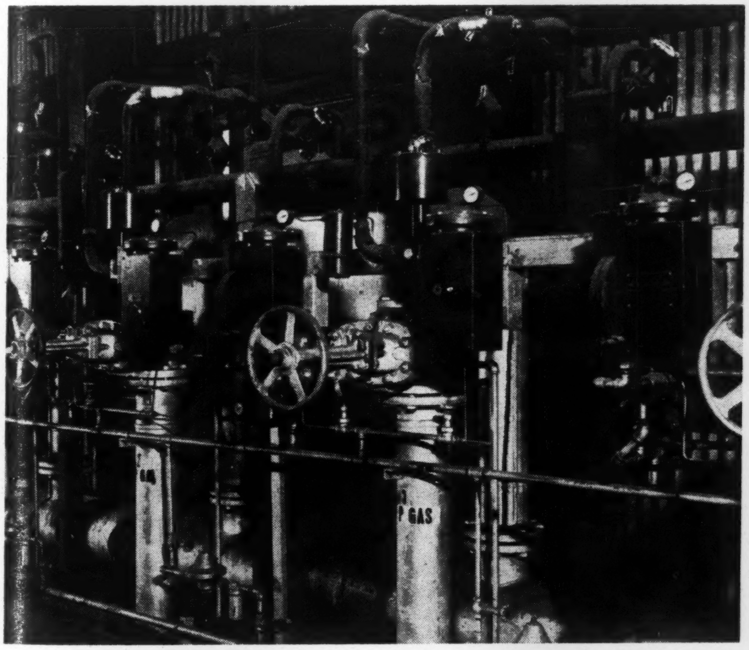


Fig. 5. Gas and fuel oil transmitters and valves for one bank of soaking pits are mounted on the floor level behind the control houses. A transmitter is installed in the fuel lines to each pit and converts the fuel measurement to an air impulse signal that is imposed on the fuel measuring unit. No fuel lines enter the control houses.

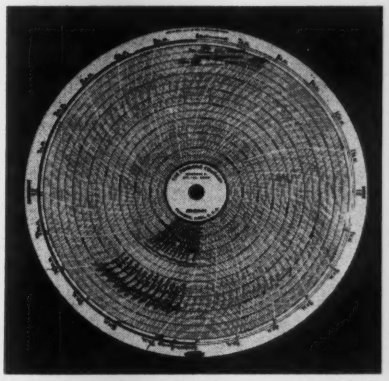


Fig. 7. Record from open hearth temperature control instrument, a six point circular chart recorder. The lower continuous line depicts the temperature of steam for atomization. The upper continuous line around the chart represents the stack temperature. (This is from a thermocouple just after the main stack damper and it usually records at about 1250°F.) The crisscross lines are recorded from thermocouples and represent temperatures in the flue outlets.

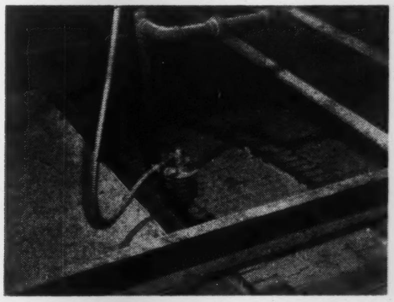


Fig. 8. Primary element for open hearth roof temperature control consists of a "Rayotube" on the roof of the furnace.

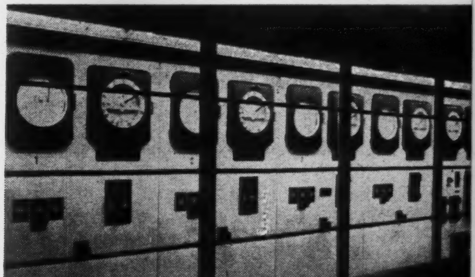


Fig. 6. Front view of a control house for one bank of soaking pits.

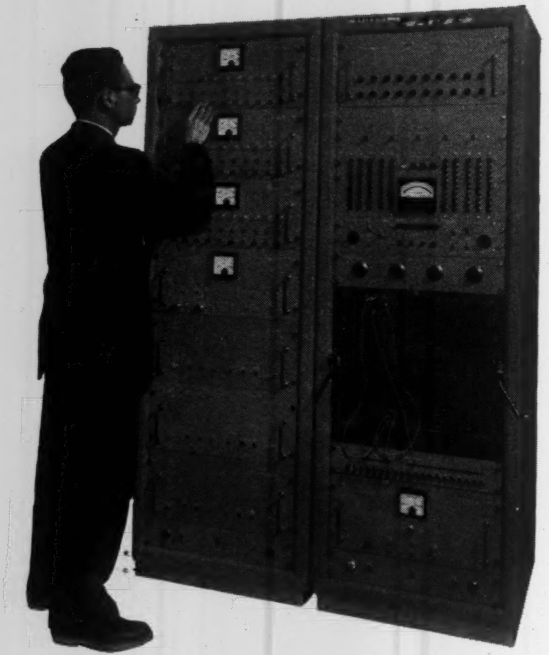


Fig. 1. Basic EASE Computer satisfies need for small, inexpensive machine but can be expanded as the process control engineer's problems become more complex. This unit contains 30 amplifiers. At left is the Model 1185; at right, Model 1187. (EASE is a registered trademark of Berkeley Division, Beckman Instruments, Inc.)

Process Control and the

The analog computer can be used both to design the control system and to control the system. Here are the elements of the analog computer and examples of how the computer can be used in the process industries as either a basic analyzing device or as a controller.

ANALOG COMPUTERS and analog techniques are finding their place in process control as the demand for flexible and diverse control equipment grows. Analog-type electronic components have established a record of high reliability. As more transducers are developed and technical personnel trained, these components are being applied widely. Such rapid acceptance is due largely to the versatility, accuracy, and low cost of the electronic approach. These and other advantages become apparent as the techniques are understood.

The concept of feedback control has been used for many years in the field of electronics. In general, feedback techniques can be described as follows:

1. Compare the actual value of the controlled variable to the desired value (error detector or comparator).
2. Feed the difference (error) into an amplifier.
3. Feed the amplified error signal into a controller which drives the actuator.
4. The actuator operates on the process to reduce the original error.

Advantages of Feedback

The closed-loop controlled process is essentially the same as conventional negative feedback as used in the electronics industry and offers the same advantages, as illustrated by comparison with a system without feedback (an open-loop system). Fig. 3 shows an amplifier (represented by a triangle) with input e_i, output e_o, an input network, and a feedback network. Regardless of the input signal to the amplifier, the output should be A times its input (gain of A). This may be an electronic amplifier, it may be a position indicator (angular or linear), or it may be a pressure system. The same rules apply.

If no feedback is used, it is found that as the gain A becomes greater than unity, accuracy is increasingly difficult to maintain because of vacuum-tube characteristics, gear backlash, etc. Consequently, for any amplifier with a gain of 50 or more, accuracies of the order of ± 1% are difficult to achieve, and accuracies of the order of 0.1% or better are nearly impossible. However, when feedback is used to close the loop, as shown in Fig. 3, it is found that as the gain A increases, instability shrinks

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Presented at the Computer Clinic, Second International Automation exposition, Chicago, Nov. 14-17, 1955.

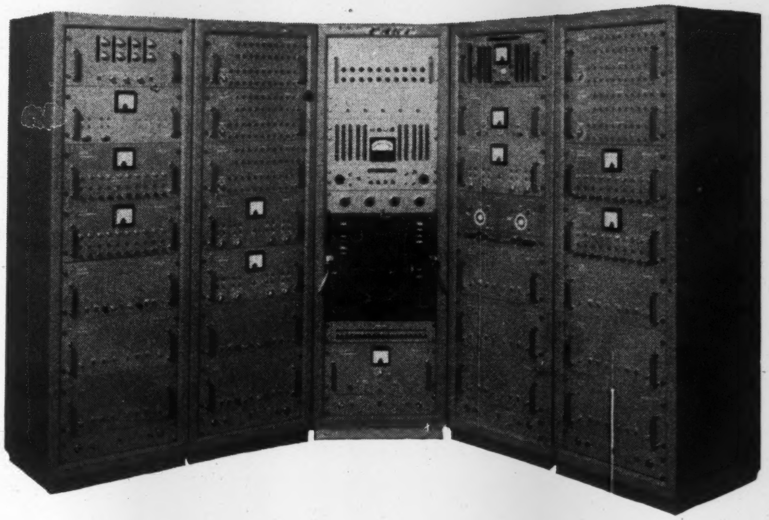


Fig. 2. The heart of this expanded EASE Computer is the patchboard in the center cabinet (Model 1187). The two cabinets at either end, Model 1185s, house 20 amplifiers each and their power supplies. The cabinet at right of the patchboard contains electronic and servomultipliers. At left of the board is another Model 1185 housing electronic function multipliers.

Analog Computer

JOSEPH L. HUSSEY
Berkeley Division
Beckman Instruments, Inc.

and accuracy can be achieved more easily. With feedback, accuracies of 0.01% and better are attainable.

Every closed-loop control system is a system that uses feedback. The analog computer is a device that permits the system designer or control engineer to determine exactly how much feedback and what type of feedback he should use in order to achieve optimum control of his system.

Elements in the Analog Computer

A brief explanation of the analog computer and how it functions will dispel any fears or feelings of mysticism that process engineers may have about these devices.

Analog techniques generally use the following building blocks:

1. D-C negative-feedback amplifiers
2. Attenuators
3. Multipliers
4. Arbitrary-function generators
5. Combinations and special forms of all the above.

D-c amplifiers (represented by the triangle in Fig. 3) can be made to perform as summing devices, inverters, subtractors, integrators, or differentiators by suitable choice of input and feedback networks. (Inverting is defined as changing the voltage polarity.)

Attenuators (precision potentiometers) can be used in conjunction with the d-c amplifiers to allow continuous control over the gains of the various amplifiers, permitting different modes of operation. These controls can be mounted at a central control console connected to the system only by cables. The result: efficient control over the process by a single operator in minimum space.

Multipliers are used to form the products of two voltages. These can be all-electronic or electromechanical in nature.

Function generators are used to generate a voltage which will be an arbitrary function of an applied voltage.

Typical problems require use of computers with anywhere from 10 to several hundreds of amplifiers, and from 0 to 20 or 50 multipliers, and other equipment in this same ratio.

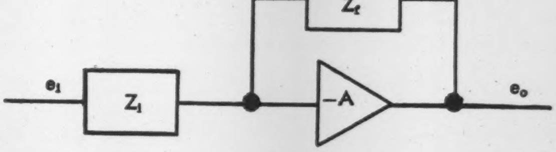


Fig. 3. Closed-loop system comprises an amplifier with feedback from the output to the input.

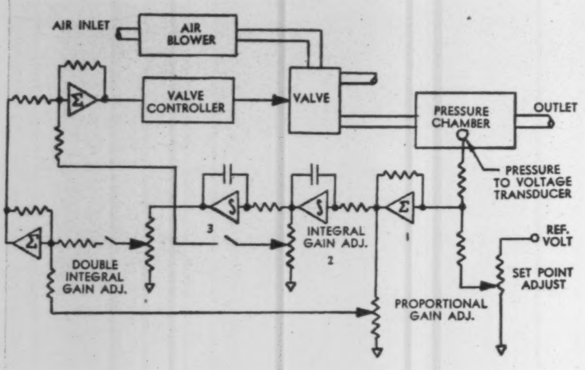


Fig. 4. Three summing amplifiers and two integrating amplifiers are used here to establiish the amounts of proportional, integral, and double-integral control actions required for optimum control of valve.

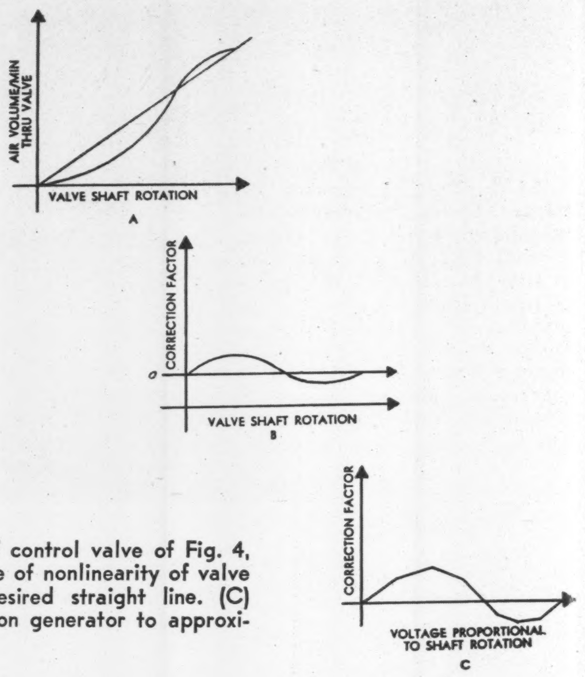


Fig. 5 (A) Characteristic of control valve of Fig. 4, showing nonlinearity. (B) Curve of nonlinearity of valve —i.e., departure from the desired straight line. (C) Curve generated by the function generator to approximate curve (B).

The Patchbay

This equipment, in order to be tied together to simulate the desired system, must have some means of connection. This interconnection system is the heart of the analog computer. It is usually a patchbay system with a removable patchboard. Through the use of the patchboard, all of the components (amplifiers, multipliers, etc.) can be wired together in such a way that they will be the electronic analog for the chemical, mechanical, or hydraulic system under study.

Most high-quality analog computers available today have been designed on a module system. This allows the user to start with a small machine (one patchboard and 10, 20, or 30 amplifiers and associated equipment) and later, as his understanding of the problem grows, to add more equipment to this machine so that he can handle even his largest problem (see Figs. 1 and 2).

Function Generators

The cabinet at the left of the patchboard in Fig. 2 (Model 1185) contains electronic function generators. These are the units which allow the generation of any arbitrary function of the input voltage. The function generators manufactured by Berkeley Division, Beckman Instruments, are of three types; all are based on the principle of approximating the desired characteristic by a series of straight lines. The straight-line segments are generated by use of diodes.

The simplest and least expensive function-generator is set up by hand. It requires the use of two external d-c amplifiers, reference voltages, and attenuators in order to set up the desired function.

The second unit is somewhat more costly but is still manual. However, it has its own d-c amplifiers and associated calibration circuit. It is this unit that finds its place in process control because it is somewhat simpler to set up than the first model. Even though it contains its own calibrating circuits, it is not particularly adaptable to repeated set up. However, its use as a linearizing element in a process controller does not require that it be set up repeatedly; the engineer may set the unit up once and leave it for a considerable length of time. As such, this unit—the Model 1073—becomes of particular interest to the control engineer.

The third unit—the Model 1071—employs a servo system in conjunction with a pushbutton control panel in order to set up the desired transfer characteristic. The use of a pushbutton setup allows much faster calibration. For this reason, if the control engineer must often change the transfer characteristic under study, the Model 1071 should be used. The time saved in setup more than offsets the higher initial cost.

When all of this equipment is tied together and the control engineer has patched in his particular problem, he can investigate the entire system being studied or any part of it; also, at any arbitrary time in the process of problem solution, he can stop the machine to examine the behavior of any component within the system. This holding feature allows a safety factor for the engineer.

Scaling and Overload

All critical circuits contain overload detector circuitry connected in such a way that, at the discretion of the operator, the machine may be automatically switched into the hold position if any amplifier or multiplier or function generator within the system indicates an overload. By this technique the engineer is given warning that the problem under study has not been scaled properly. He can then rescale the problem.

Patchboard Capacity

The amount of equipment that can be patched in a given computer installation is determined primarily by the amount of equipment that can be interconnected at one patchboard and by the number of patchboards that

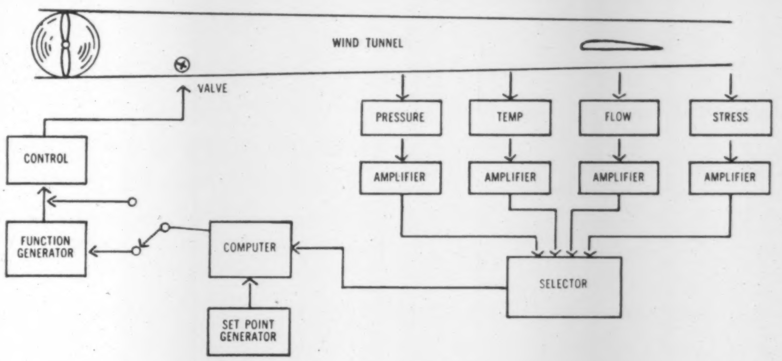


Fig. 6. Analog computer receives data from several variables and, with function generator, establishes a program based on conditions within the process.

may be operated with one another. The patchboard provided on the Model 1032 provides access to 50 d-c amplifiers, 16 single-product electronic multipliers, 10 arbitrary-function generators, and 6 servos which can each produce 6 products. It also provides access to 100 coefficient potentiometers. The potentiometers of this system are set by remote control through the use of a pushbutton system and a servo control.

Of the 50 amplifiers provided for by this patching system, 20 may be summing amplifiers, 20 may be integrators, and 10 are used as inverters or general-purpose amplifiers. Each integrator has associated with it a switch which will connect it either as an integrator times unity or as an integrator times 10 (the switch will change the feedback capacitor from 1 microfarad to 0.1 microfarad). The patchboard itself is removable and can be connected by the engineer at his desk. This allows another engineer to be using the machine while other problems are being wired.

The patchboards used with the EASE computer have the unique feature that as they use one hole of the patchbay, they create another one. That is, the connector is both male and female. Accordingly, a beginner does not have to worry about the manner in which he patches a given problem; he can never run out of terminals. In addition to the equipment described, there is available at this patchbay equipment necessary for the control of the machine and for proper simulation of some nonlinearities. This includes diodes for functions such as backlash and friction. It also includes reference voltages, bias voltages, and certain switching functions.

Experience has shown that at least three or four of these patchbay units can be interconnected to allow operation of 100 to 300 d-c amplifiers and their associated equipment. From this, it is seen that the computer of Fig. 2 can be expanded as needed. This, of course, has required considerable attention to such factors as the grounding system, power supply, and interaction. The design of the computers is such that there is no limit to the number of patchbays that can be tied together.

A Pressure Control System

To illustrate the flexibility of simulation techniques, consider a pressure control system that might require, for optimum control, double integral control plus proportional control. Fig. 4 shows the system.

The designer for such a control system must determine two factors: (1) compensation necessary (if any) for the controller and process characteristics so that uniform accuracy is maintained over the complete operating range, and (2) which combinations of proportional, derivative, integral, and double integral gains will give proper performance. These gains and the ratios between them will be different for each system.

The parameters can be determined by long-hand calculations, by "cut and try" approach, or by simulation techniques. Simulation can save considerable time and money in the design phase, as well as provide experience for the electronic systems to follow. (Analysis of operating plants by simulation can also point the way to savings via change in control system, or process equipment, or both.)

In Fig. 4, three summing amplifiers and two integrating amplifiers are used to simulate the controller. The potentiometers and switches can be located remotely from the remainder of the equipment. The potentiometers indicated allow four types of control:

1. proportional (amplifier 1)
2. proportional + integral (amplifiers 1 and 2)
3. proportional + integral + double integral (amplifiers 1, 2, and 3)
4. proportional + double integral (amplifiers 1 and 3).

The switches allow selection of the desired control, while the potentiometers allow the relative gains to be adjusted to the desired values. The system can be modified for various other types of control, including derivative (anticipatory) control. With additional equipment. temperature, humidity, etc. could also be controlled.

All the electronic components in the system have high speed of response; the limiting factor will be the speed of response of the valve controlling the air flow.

Characterization by Arbitrary-Function Generator

To further complicate the preceding example, assume that is it desired to regulate the air pressure of the chamber over a wide range of pressures. To maintain equivalent control accuracies at high pressures as at low pressures requires that loop gain stay the same. The valve, however, if it is the rotating type, has a nonlinear characteristic which must be compensated. This linearization of a nonlinear element is easily accomplished electronically with an arbitrary-function generator.

The function generator produces an output voltage which will maintain a predetermined relation to the input voltage. This can be accomplished by biased diode circuits which change the gain of the unit as a function of the input voltage. Essentially, this system approximates the desired gain characteristic with a series of straight line segments. The slopes and intersections of these line

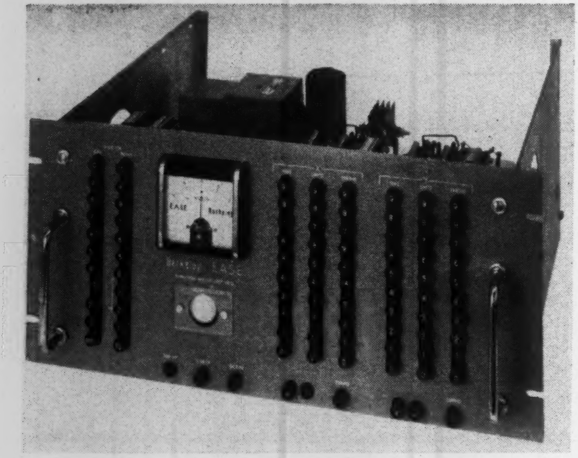
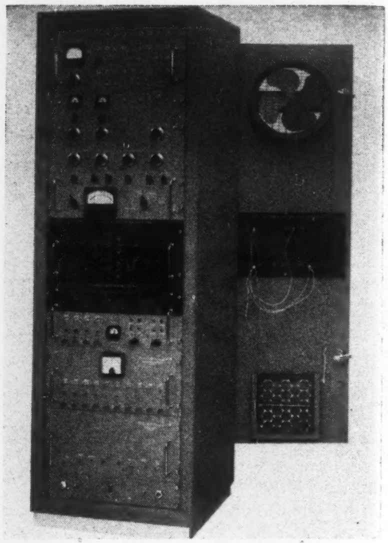


Fig. 7. Model 1032 function generator.

Fig. 8. A control system, the first of its kind, for a high-speed wind tunnel.



segments are continuously adjustable in most commercial units.

To illustrate the use of an arbitrary function generator, let us linearize the characteristic of the valve of Fig. 4. This characteristic is shown in Fig. 5a. The departure from a straight line (nonlinearity) is plotted in Fig. 5b. A function generator then can be adjusted to approximate this correction curve (Fig. 5c). If this function generator is then used in the control loop, the nonlinear destabilizing effect of the valve can be eliminated.

Wind-Tunnel Computer Controller

The previous example showed how the analog computer can be used to analyze a control situation. The computer can be used also to perform the control actions required in situations of great complexity.

Fig. 6 shows an analog computer incorporated within the control loop so as to control the process in accordance with a program based on the pressure, temperature, flow, and stress variables in a wind tunnel. Data on all these variables are extracted by transducers, amplified, and transmitted to the analog computer. The program for the entire system is established by a function generator. The inputs are linearized and time compensated to prevent oscillation. The output of the computer actuates the control devices which operate the wind tunnel.

Fig. 7 shows a Model 1032 function generator which was used as the function generator in Fig. 6 to program the entire operation. A general-purpose EASE computer was used as the computer in the system. The advantages gained were rapid automatic correction of conditions based on results, optimization of the process, and accurate control of the process over a short time interval.

Fig. 8 shows the first closed-loop control system using these analog techniques for control of pressure and temperature conditions in a high-speed wind tunnel. It will be used to test jet engine operation at Arnold Engineering Development Center, Tullahoma, Tenn.

Mating the Fields of Computing and Process Control

At this point, the reader may remark, "What you say here is fine, but the fact remains that we who have the problems do not understand electronic techniques, and you who have the electronic techniques do not understand our problems," and we must all agree. This problem is currently being solved by each of us learning more about the other's techniques.

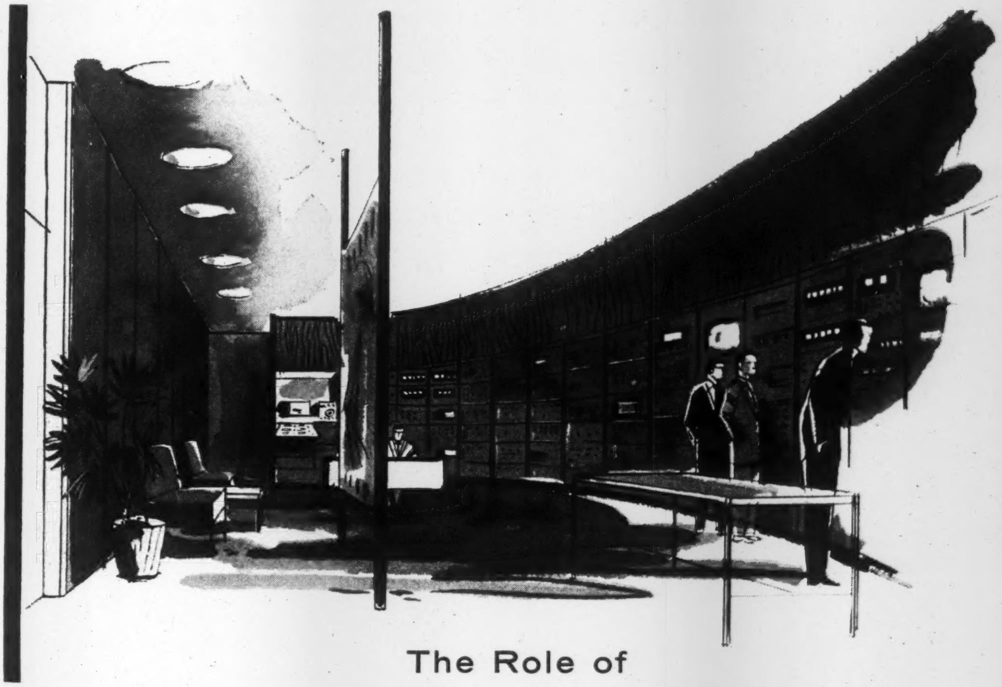
Manufacturers of computing equipment must expand and explore new fields, such as the field of process control. To do this, they are willing to expend considerable money to train people in the field of process control. Many large computer companies have organized a staff of trained engineers who will spend the time necessary to study the problems of the process engineer.

In addition, qualified consulting engineers and engineering groups are organizing all over the country. These consulting companies have people who are well versed in the field of electronic techniques and who also understand the process engineer's problems. These people will, for a fee, help the process engineer to apply electronic equipment to his problem. From this, it would seem that the people in the electronic field are doing their part to help the control engineer adapt electronic equipment to his problem.

On the other hand, the process engineer is currently spending a great deal of time in familiarizing himself with electronic equipment. There are many large companies, particularly in the petroleum fields, who have groups of engineers whose prime aim is to apply electronic controlling techniques and computer techniques to their particular processes. The two groups, working toward a common goal, will eventually solve the problem of applying electronic computers to process problems.

In general, it would seem simpler to have the process control engineer learn the electronic techniques rather than vice-versa, and there is much for the process man to gain. This is particularly true when he can use electronic equipment to solve the mathematics of his problem and gain a better understanding of his problem. In fact, it is this understanding and familiarity with both systems (that is, both the electronic and the controlled system) that makes him much more valuable to his company. As he works with the problem in the machine, he becomes much more aware of which factors within his own system which give rise to poor performance.

Editor's Note: Classes on analog computers are available to all process men at the Third International Automation Exposition, New York, Nov. 26-30.



R-W Data
Reduction Center
now under
construction

The Role of INSTRUMENTATION and TEST EQUIPMENT in Systems Work

Denver plant now under construction will augment the Division's manufacturing facilities

Instrumentation development

The complexity of modern weapons systems, as well as certain electronics systems for industrial applications, is such that the design and installation of instrumentation for obtaining experimental test data and converting it into usable forms has become a highly specialized field of technology.

A closely related field is that of test equipment needed for the adjustment and maintenance of the end-product hardware, both in the manufacturing plant and in the field. Experience has shown that the effectiveness of a major new system frequently falls short of its potentialities because of inadequate attention to this essential supporting activity.

In The Ramo-Wooldridge Corporation, the Electronic Instrumentation Division has the mission of bringing to the areas of instrumentation and test equipment a level of competence that is adequate to deal with the often very difficult problems that need to be solved in such work.

Assignments undertaken for a number of government and industrial customers include such diverse projects as flight instrumentation, data reduction equipment, and transistorized power supplies. Another important project of this Division is that of providing The Ramo-Wooldridge Data Reduction Center with a system and arrangement of equipment carefully designed to meet the company's specific requirements. Also in progress is the development and fabrication of field test equipment for an electronic system R-W now has in early production.

A unique and important feature has been incorporated into the services offered by the Electronic Instrumentation Division. For each project, an advisory committee is established composed of experienced systems engineers from other divisions of the company. By periodic reviews, such advisory committees assure that the development work of the Electronic Instrumentation Division takes into account the very special and often not well understood needs which arise in systems work.

Further information about this R-W activity can be obtained by writing to the Director, Electronic Instrumentation Division.

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Journal of the S C M A . . .

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Economic Aspects of
PROCESS CONTROL

Practical examples show the dramatic cost savings possible via the integrated data-handling-computing-controlling control center. Even greater benefits now await fuller cost analyses. The pneumatics vs electronics cost situation is discussed in detail.

WILLIAM C. GARDNER
and
JOHN E. LEARY
C. F. Braun & Co.

YOU have read and heard a great deal about automation. Much of the discussion has centered around the effects of automation on employment. Some view automation as a monster that will throw people out of work; others credit every productive advancement to automation alone. Neither extreme view is true; automation is only one of the many factors responsible for the state of our economy. The transition from semi-manual to completely automatic operations will be a gradual evolution—as the employee is relieved of menial and repetitious operations, he can be upgraded into work requiring judgement and higher skills.

The concept of the push-button plant has been highly publicized. Indeed, there are cases of high degrees of "humanless" operations. However, when the term automation is applied to a process, it frequently implies that all decisions must be made by machines.

Machines required to make a variety of decisions must necessarily be complex. The costs of such intricately programmed machines will be prohibitive in highly competitive businesses. In other fields, such as missile-guidance systems, there is no alternative other than complete automatic control, and other factors are given more consideration than economics. In the process, however, the complete elimination of the human operator does not appear to be economically feasible in the immediate future—because unless the problem is highly repetitive, human reasoning is costly to replace.

Investment in Instrumentation

Evidence of the increasing role played by instrumentation is shown by the increase in instrument sales compared to plant investment. In the past few years, American industry has invested over three times as much in yearly plant expansion as in 1930. But the yearly investment in instrumentation has been ten times that of 1930. During this same period, while the total plant investment per unit of output has fallen off slightly, production has increased greatly, and the man-hours per unit of output have declined rapidly. Because of this relationship, economists predict that we eventually will have a 32-hour work week.

In recent years the cost of instruments has ranged from 5% to 15% of process-equipment costs. This wide range may be explained in two ways—(1) instrument control is inherently less costly for some processes than others, and (2) in many cases we are not making full use of recent developments in instrumentation. In plant design, more consideration should be given to the available dynamic-response and accuracy of the control systems. Instruments with faster response time will enable us to reduce surge capacities and consequently the size of process equipment.

During the next ten years, 800,000 new productive workers will enter the process-industries each year. Industry will invest an average of $10,000 per worker for production facilities. Each year, instrumentation alone will cost from $60 to $500 for each worker in these industries. Let's see how this money will be spent.

November Meeting: *Thursday, the 15th, Rio Hondo Country Club, Downey, Calif.*

Feature: *Robert Bryan, Air Pollution Control District of Los Angeles County, will present a talk on "Air Pollution Monitoring Instrumentation."*

Prepared for the Conference on Instrumentation and Control in the Process Industries, Sponsored by Armour Research Foundation, January 25-26, 1956.

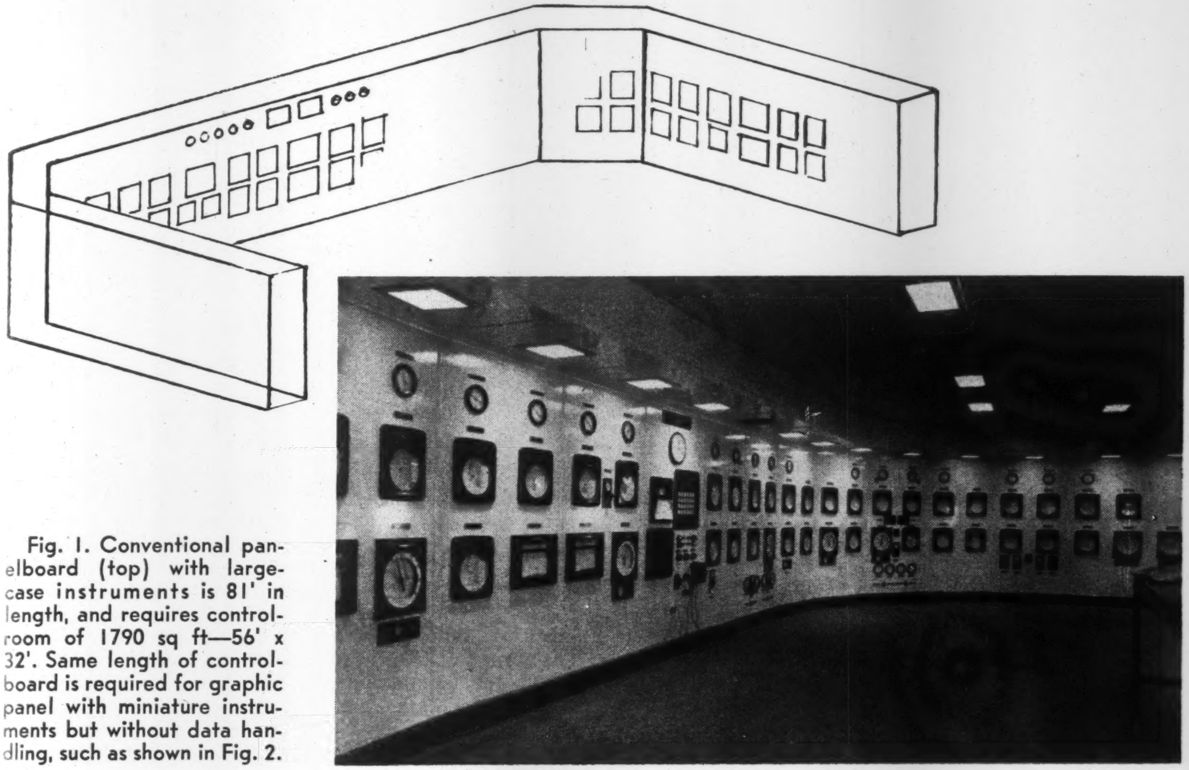

Fig. 1. Conventional panelboard (top) with large-case instruments is 81' in length, and requires control-room of 1790 sq ft—56' x 32'. Same length of controlboard is required for graphic panel with miniature instruments but without data handling, such as shown in Fig. 2.

Electronics Versus Pneumatics

Although the use of electronic systems is increasing, pneumatic systems have certain advantages and are not yet ready to be classed with the horse and buggy. Most pneumatic instruments use a standard 3-to-15 psi signal; the user does not tie himself to any one make by using pneumatics.

Signal Standardization. In contrast, electronic manufacturers use several incompatible signals—a-c and d-c signals with response to voltage, current, and frequency. Hence once an instrument supplier is selected, the use of other makes becomes impractical; additional components must be used to convert from one manufacturer's signal to another. There is a need for agreement among suppliers and users on a standard. The best signal can be determined only after actual operating experience has been gained with the equipment now available.

Transmission Costs. A complete comparison of pneumatics versus electronics must include the cost of signal-transmission between instruments. Electronic transmission uses standard wiring and conduit methods. However, pneumatics affords several alternatives—either single-tube or multi-tube cables of metal or plastic. While wiring costs are fairly uniform, tubing costs may vary by a factor of five. The location and arrangement of field-mounted instruments play a major part in the final choice.

Valve Actuators. There is also much development work underway on the control-valve actuator. Until the response of this actuator is improved, the speed of the electronic control system cannot be utilized fully. In addition to these problems that must be solved by the manufacturer, the instrument user has a problem—he must keep pace with these latest developments. Otherwise, he will find he lacks first-hand experience in reliability, maintenance and operator training for the better equipment.

Data Handling

Use of electronic instrumentation is increasing with the introduction of data-handling systems. A complete data-handling system for process applications would perform the following operations.

1. Accept input-signals for flow, pressure, temperature, and other variables.
2. Printout a complete log-sheet at regular intervals or on-demand.
3. Continuously scan variables for off-normal conditions.

In addition, many auxiliary functions may be performed. For example, a digital-indicator can be used for on-demand readout of any one point. A trend-recorder may be used for tracking one or more variables. Computations such as totalizing, averaging, and determination of unit-efficiency can be performed. Digital output can be recorded in the form of perforated-tape, punched cards, or magnetic-tape. The cards or tape can be fed to computers for further computing and accounting operations.

Tangible savings can be realized by installing data-handling systems. The system permits reduction in the number of instruments on the controlboard, resulting in savings in instruments, controlboard, and control room. Since data are automatically logged, the operator is free

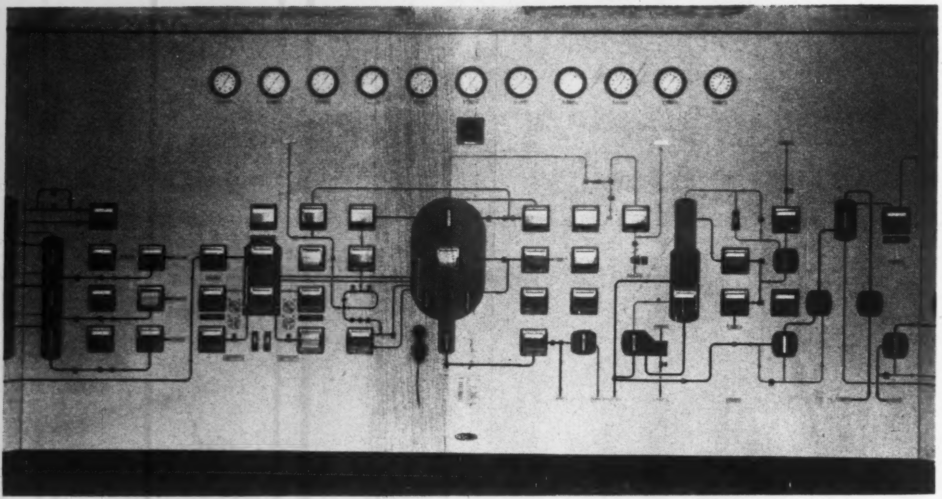

Fig. 2. Example of modern graphic panel with miniature instruments.

to perform other important duties. This more efficient use of operator time can be converted into further dollar savings.

Still other advantages cannot be evaluated readily in terms of dollars. In addition to savings of operator time, use of data-handling systems reduces the clerical services required to tabulate and summarize data. Automatic data-reduction and computation provides daily summaries of unit operation for accounting, engineering, and management, without duplicate effort. Management can make up-to-the-minute evaluations of all operations.

Further, automatic logging and off-normal scanning allows the operator to devote his full attention to corrective measures during an emergency condition. Invaluable records are provided for later determination of the cause of upset. Scanning and logging records cannot be falsified; because of this, the supervisor has a true picture of the conditions during an upset.

Computer Control

More efficient and more complete automatic control of processes of the future requires extensive studies by both process and control engineers. Data-handling systems are one of the most important tools for obtaining data for these studies. From the analysis of process and data we feel there is a need for the development of a computer designed for process-control requirements.

More emphasis must be placed on both the dynamics of the process and the proposed control-loops. Much of the judgement presently exercised in process design must be replaced by the applied mathematics on which the computer logic relies. The output from a data-handling system then can be fed into such a computer. The computer would be programmed to re-adjust control elements in order to attain maximum plant efficiency. By this method, the many independent control-loops of today would be tied together into an integrated control system. Again, we must obtain actual operating familiarity with the data systems now offered for the process industries before we can soundly approach the development of computer control.

Composition Analyzers

The continuous composition analyzer will play its part in automatic supervisory control, and will eventually be tied into the same computer described for data-handling outputs. The most important data required for plant control are composition analyses. In present laboratory

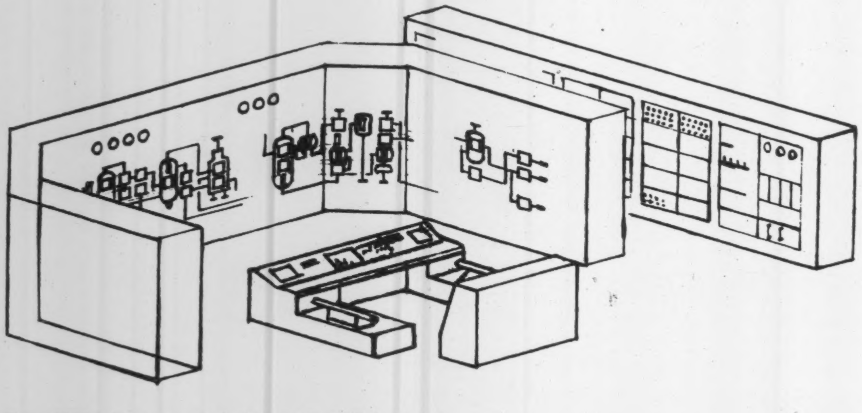

Fig. 3. Graphic panel with miniature instruments and data handling for same process shown at top of Fig. 1 requires 48' controlboard, and 1380-sq-ft room (43' x 32'). Many indicators and recorders are eliminated because of the data-handling technique.

techniques there is a long time-lapse between the taking of the sample, running lab-tests, and making corrective adjustments. In addition to the time lag, there is the problem of intermittent sampling; process conditions often change completely between taking the sample and obtaining lab results.

There are now available several types of continuous composition analyzers:

Mass spectrometers
Infrared analyzers
Ultraviolet analyzers
Viscosimeters
Specific-gravity analyzers

These instruments can be used to automatically reset conventional controllers to meet desired product specifications, or as a guide for manually adjusting the controller set-point.

Payout. Economic justification for these instruments is easily shown for most processes. For example, let's look at the application of a mass spectrometer in a sulfur plant. Plant capacity is 35 to 40 tons per day. The sulfur product is valued at about thirty dollars per ton. By the installation of a $10,000 mass spectrometer, a refiner improved operating efficiency by 2 to 3%. This improvement paid for the spectrometer in less than one year. With larger throughputs, the savings due to elimination of off-spec products and reruns represents even more money.

Rental Plan. There are, of course, marginal cases where economic justification cannot be shown so easily. For such cases, many analyzers are offered on a rental basis. This permits the user to evaluate the effect of the instrument for his particular application. If operations are improved, he can justify the purchase of the analyzer. Most rental plans allow the rental payments to apply to the purchase price.

Control-Room Size

Most of the instrumentation which we have discussed is located in a control room, the operating nerve center of the plant.

Large. Ten years ago large-case instruments were the accepted standard. Big control rooms were required to house these instruments, and familiarity with the process and considerable experience were required of the operator. Several years ago, graphic panels were developed as processes became larger and more complex. This, in turn, led to the development of miniature instruments.

Medium. The control room of today presents an entirely new concept of process instrumentation. Graphic panels with miniature instruments offer several advantages—all instruments are presented in a more compact display; operator training is simplified; supervision of process control is more centralized and better coordinated.

Small. The increasing use of data-handling systems will decrease the number of panel-mounted instruments. Readout devices for the system will be located on an operating console, and the graphic-panel display will be reduced to a small flow diagram at the console. Small alarm-lights, miniature instruments, and compact controlboards will permit future operations to be carried out in an officesize control room. Several savings will be realized from such an arrangement—fewer operators will be required, and the smaller room will be less expensive.

Specific Cost Comparison

Let us illustrate the application of some of these trends to a specific process unit. We have selected a modern crude-unit now under construction. This is a large unit with a throughput of over 100,000 barrels a day. The unit plot is some 450 feet square. This unit will serve as a basis for comparing the costs of several alternative instrument systems.

Pneumatic Versus Electronic. For this unit, we compared wire in rigid-conduit against cabled copper-tubing. Because of the arrangement and location of the instruments, we did not find a significant difference in the installed costs of transmission.

Next, we looked at the cost comparison between the instruments proper. The electronic systems, in some cases, require one less component; in other cases the nearest electronic equivalent to a pneumatic instrument cost considerably more. We found that the electronic instruments ran some 30% higher than pneumatic.

Influence of Data-Handling. Our basis is a complete system incorporating all the data-handling functions previously discussed. Many recording and indicating functions have been transferred from the controlboard to the data system. All controllers remained on the board. However, many recording controllers now became indicating controllers. This reduced the number of boardmounted instruments by 40%. The board length could be cut from 75 to 50 feet. These savings amounted to some $30,000. Better utilization of manpower allows us to use one less operator per shift. On this basis, the remaining cost of the data-handling system is paid for in about two years. In addition, we have gained the many advantages already discussed, including complete, high-speed and reliable data-recording, continuous process monitoring, and a summarized presentation of plant operation.

Use of Small Control Room. As we rely more and more

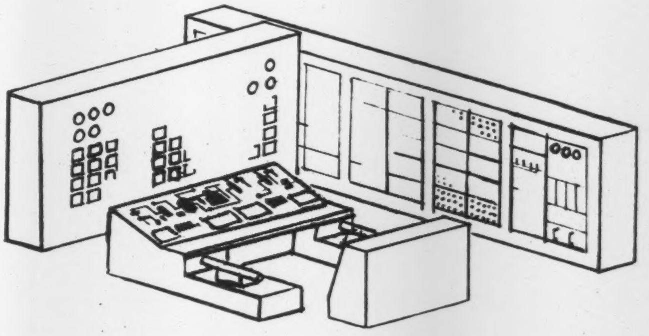

Fig. 4. When graphic display is miniaturized and transferred to the operating console, the controlboard of Fig. 3 is reduced to 16' and controlroom to 700 sq ft (28' x 25').

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on the data-handling system, we can transfer the graphic-display from the main board to the operating console. Instead of a 50-foot graphic panel, we now consolidate the same number of miniature instruments onto a board some 20 feet in length. The operating-console, data-handling system equipment cabinets, and the compact controlboard can be housed in a much smaller control room. We reduce the control room by 60% and save approximately $10,000. Add to this a $6,000 reduction in controlboard cost. Overall, we reduce the initial investment by some $16,000 by the use of the compact controlboard.

Three control-room drawings illustrate the evolution of control-room instrumentation. Each drawing is based on the specific crude-unit we are using as an example. Fig. 1 shows the controlboard as it might appear using large-case instruments; approximately the same length controlboard would be required for a graphic-panel with miniature instruments and without a data-handling system. In Fig. 3 we see the control room as it was actually installed. In the instance the data-system allows us to delete many indicating and recording instruments from the controlboard. The control-room floor area is reduced by 23%. Fig. 4 shows the effect of using miniature instruments in a compact arrangement with the graphic presentation on the operating console. With this arrangement, the required control room area is reduced some 60%.

Equipment Savings. If surge capacities and vessel sizes were reduced by only a few percent, the savings in equipment costs would be appreciable. We have not evaluated such savings in our example. For such a large unit, however, these savings could well represent a large portion of the total instrument cost.

Although this cost comparison favors pneumatics, we must be careful about generalization. Each process unit must be evaluated by considering plot-size, instrument arrangement, and the current costs of piping and wiring methods.

Responsibility of Operating Companies

The instrument manufacturer has little opportunity to gather facts which give economic justification to many of the systems outlined here. However, he is in a unique position. He is ahead of the user; he is waiting for his instruments to be field proven, and for their wider application to catch up with current design.

This unique circumstance throws our industry a clear challenge. The progress to be made in automatic control and data-handling systems is largely in the hands of the operating companies. A combined effort is therefore required to obtain the maximum benefits which are now available to us.

He who lets others do the pioneering will have difficulty in evaluating the new equipment and their operating techniques. Although practical experience is most important to the user, both the instrument manufacturer and the contracting engineer must do their part.

Only by taking full advantage of the improvements in instrumentation can we obtain the highest profits by greater operating efficiency, increased product quality, and better utilization of manpower. It is through these advantages that instrumentation plays its part in our expanding economy.

The rate of advance towards this goal hinges largely on our ability to put in the hands of Management facts and figures which will cause them to turn from the instruments which have been used in the past to those which are offered today.

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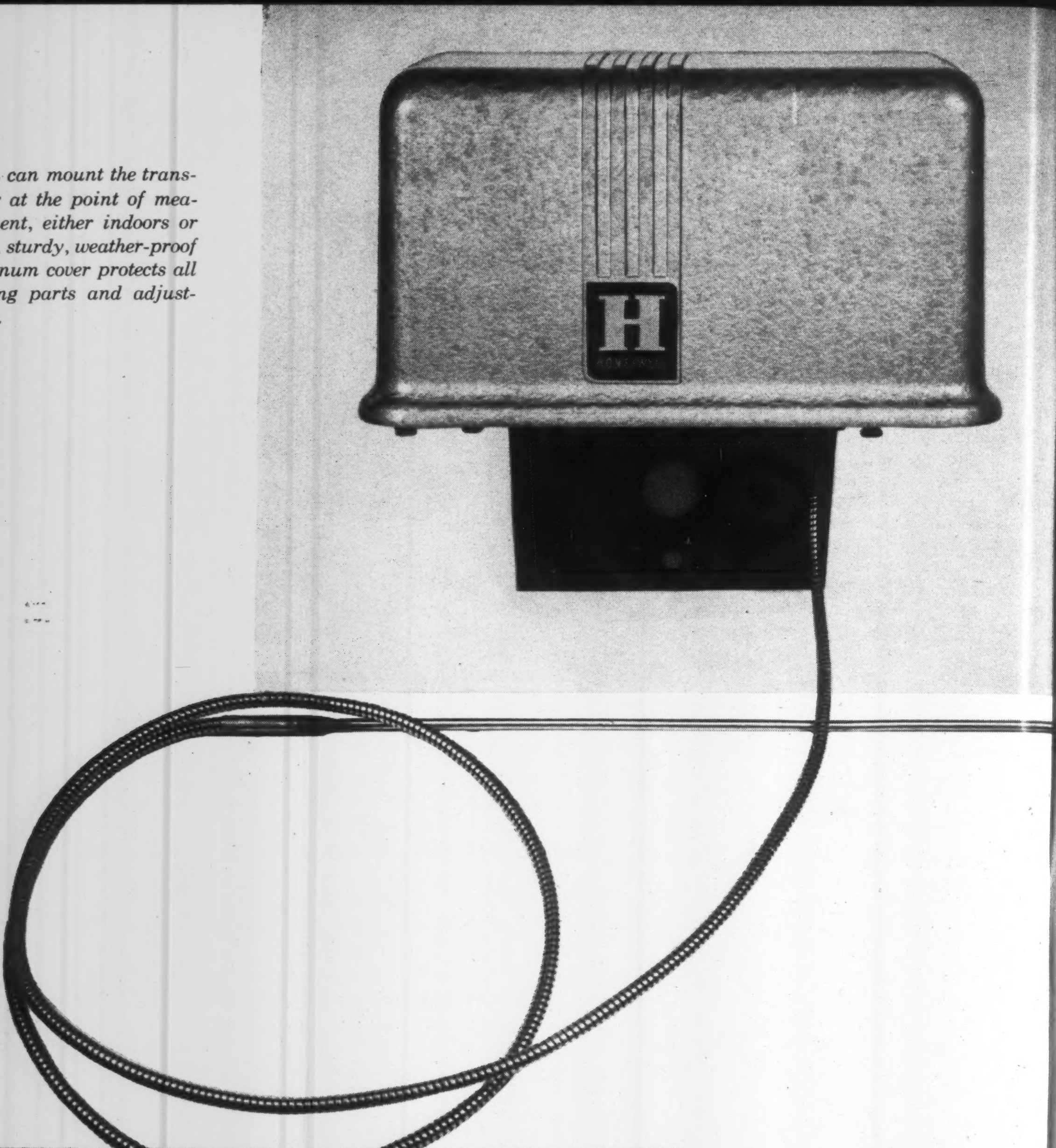
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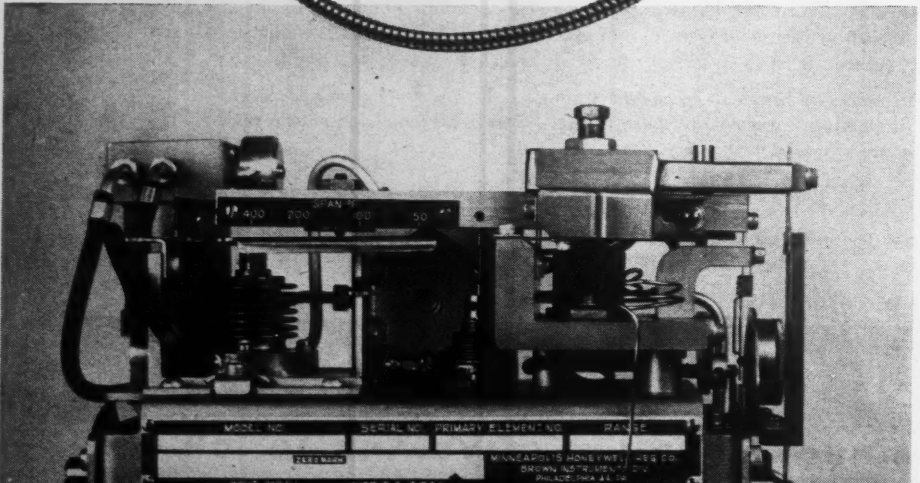
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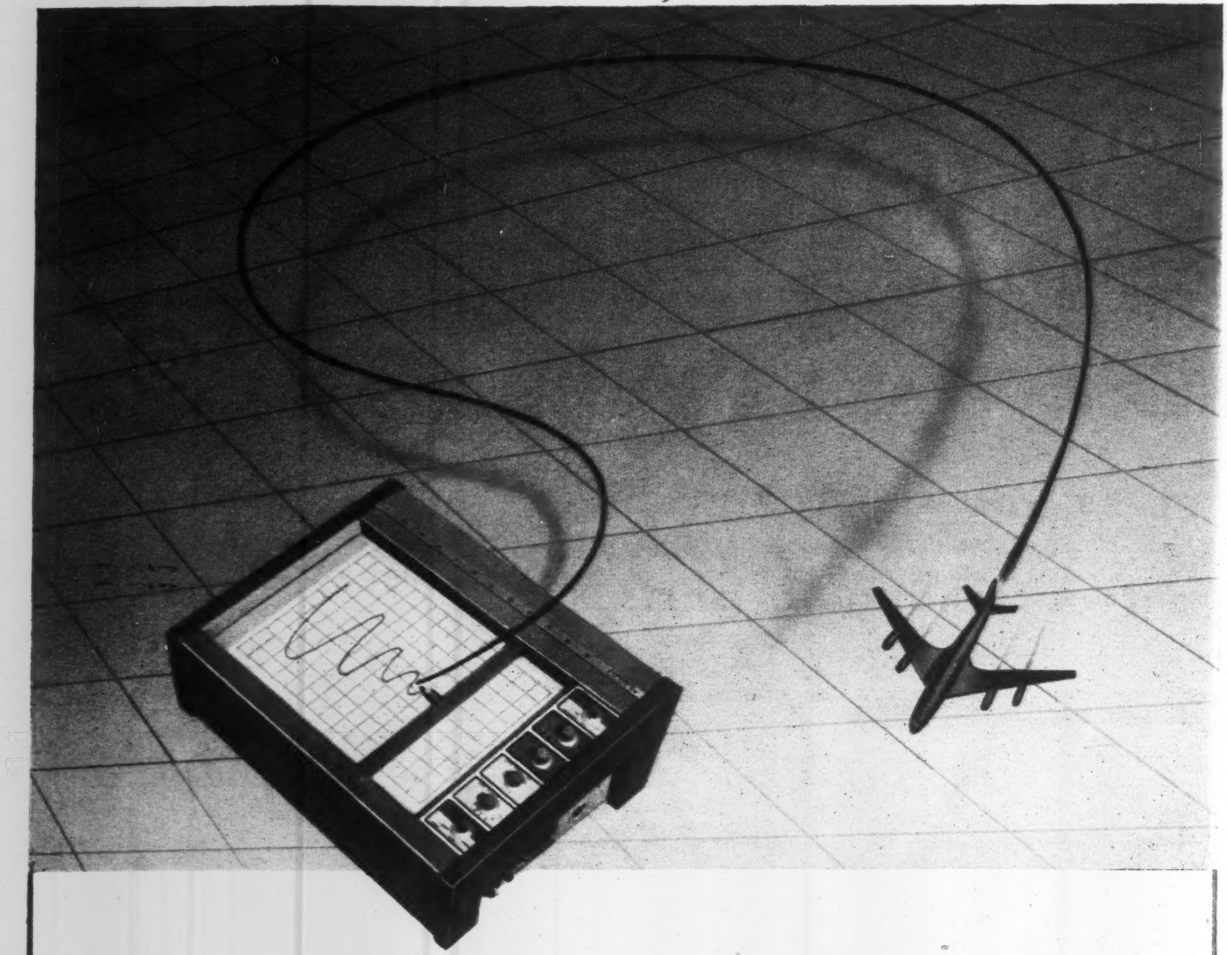

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The SIMULATION COUNCIL *Newsletter*

John H. McLeod, Jr., EDITOR

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8484 LaJolla Shores Drive
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Bits

No space for your Ed. to put in his two-bits' worth—too much real info this month. First is an almost verbatim report of a panel discussion on combined analog and digital systems intended to convey a "feel" for the subject—why it is so interesting and important. This is followed by brief descriptions of several kinds of hardware which have been produced to make the combination possible.

Pieces

PANEL DISCUSSION, DENVER RESEARCH INSTITUTE'S THIRD SYMPOSIUM ON COMBINED ANALOG & DIGITAL COMPUTATION, DENVER, 30 AUGUST 1956

John McLeod (moderator): The objective of this panel is not so much to inform as to stimulate thinking. One excellent stimulus to thinking is a good old-fashioned bull session, whether on Topic A or on computers. Today we will try to keep our minds on computers. This panel was organized (and I use the word loosely) to stimulate thinking through discussion. The panel members were selected not so much because they are "experts" (you may fill in your own definition of expert) as because I believe their varied backgrounds and interests make them representative of the rest of you here. All present are invited to join in the discussion by comments as well as questions. In this way we can bring out the what, why, who, where, when and some of the how of combined digital and analog systems. I would now like to introduce my panel:

Eric Weiss (Daystrom Systems Division of Daystrom, Inc., La Jolla, Calif.); **Bob Leger** (Convair-Astronautics, San Diego, Calif.); **Joe Hussey** (Berkeley Scientific Division, Beckman Instruments, Inc., Richmond, Calif.); **Larry Silva** (Scientific Instruments Division, Beckman Instruments, Inc., Fullerton, Calif.); **Frank Richmond** (Glenn L. Martin Co., Baltimore, Md.); **David Prince** (Engineering Experiment Station, Georgia Institute of Technology, Atlanta, Ga.)

Before starting the discussion I would like to make one thing clear: we do not intend to belabor the question of which method is better, analog or digital. I hope that everyone present realizes that this is a question which can be answered only by intelligent consideration of what in heck you are trying to do; what are your inputs and what do you expect to do with the output; is much computation involved; and what are the speed and accuracy requirements? However, it might be interesting to review some of the pertinent points, good and bad, of analog and digital techniques to build a foundation for the rest of our discussion. Joe, what do you believe are the most pertinent capabilities and limitations of analog computers?

Hussey on Analogs

Joe Hussey: The basic advantage of the analog machine is its high speed. It is capable of simulating physical systems having natural frequencies of 1,000 cycles or higher. This is difficult at 1,000 cycles on a digital machine because a sine wave should have several hundred points computed per cycle in order to plot. This means computations at the rate of several hundered thousand per second.

The main limitation of the analog is that you are measuring voltages to determine the value of the real variable of interest. These voltages unfortunately have a horrible habit of wandering around with time, and if you are integrating over very long intervals the analog error tends to be relatively high. It seems therefore that in a digital-versus-analog discussion, a first approximation of which is better for one job can be reached by considering the frequencies involved. As to accuracies, with analog equipment you won't get much less than 0.5 percent error no matter how you beat it, whereas with a digital machine it is only a question of how long you wish to take to calculate to get a relatively accurate numerical answer instead of your interpretation of the reading of some meter or recorder. A big advantage of the analog is that its speed allows you to operate in real time and therefore to tie into physical equipment.

McLeod—Thank you, Joe. Eric is well informed on digital computing techniques. I am therefore going to ask him to do for digital computers what Joe has done for analogs. I do not, however, wish to imply that Eric is prejudiced! He could probably do as good a job for analogs.

Weiss on Digitals

Eric Weiss—As John says, I do not have anything against analogs. In fact I grew up with analogs and got into digital work later, so I have to agree with Joe Hussey's points in favor of analogs, and of course if you take the negative of that you will get the points for digital.

In digital work you can get almost infinite accuracy at practically no additional cost except perhaps some additional computation time. With a digital computer you can compute a very complicated program just as easily as you can a simple one. It doesn't take any more equipment, just a little extra time. Or you can go to a special-purpose machine, in which case the more you do the more it costs, but it is possible to do it concurrently. An advantage of digital work is that it is exactly repeatable. You can do a problem any number of times and get identical answers. In digital work you can go to more intricate decisions. A general-purpose digital machine can be programmed or a special-purpose one can be built to make very intricate decisions. This requires only that you be able to give the machine definite instructions on which to base its decisions, because machines cannot think.*

McLeod—Thank you, Eric. A point was brought forcefully to my attention recently in the MIT course "Analog-Digital Conversion Techniques". Assuming that your original information is in analog form, as it is likely to be in nature, and you digitalize, then you are working with a sampled data system. This brings up all sorts of complications which I am certainly not going to get involved in now, but which I think you should bear in mind if you are considering digitalizing any analog information.

Bob Leger started serious consideration of combined analog and digital simulation over a year and a half ago. Based on early computations it was determined that a large combined analog and digital simulation was feasible, and subsequent work by Bob and his colleagues resulted in the specifications for the Addaverter (*a*nalog-to-*d*igital-*d*igital to-*a*nalog con*verter*) equipment currently being manufactured by Epsco for both the Convair and the Ramo-Wooldridge combined simulations. This simulation was undertaken to take advantage of the better capabilities of both the analog and digital computers without paying too high a price. Bob, will you tell what you are trying to do, and why and how?

Leger on Reasons for Combined Computations

Bob Leger: Suppose you start out with a relatively simple problem and want some ballpark answers. You set it up on an analog computer and get your answers in relatively short order. Then you introduce more and more details and the problem becomes more and more complicated. The price you pay for this on an analog computer is that it takes more equipment and your errors build up until you finally reach a point where you just can't go any farther. In general this costs you practically nothing in speed. Phase lag might build up to cause instability, but in general the difficulty is loss of accuracy.

With an all-digital system, as you add complexity you do in general lose a little accuracy because of round-off effects, but this is usually unimportant as compared to errors introduced by your original assumptions. However, because you are time-sharing your equipment it takes you longer. Futhermore, if you are simulating a system with high-frequency components you have to sample frequently and so are slowed down severely.

As has been mentioned, an advantage of an analog system is that you can tie actual physical hardware into the system and thereby include effects like friction and backlash which might not otherwise have been picked up. This suggests a combined simulation where part of the problem is solved on a digital computer and part of it on an analog, with the analog giving you something to tie your physical components to. But as soon as you put hardware into the system you are forced to operate in real time. You therefore must get all of your digital computations done in such a short time that you have to shift some of the computing load to the analog computer.

A happy situation occurs in many systems which we wish to simulate: the system itself is basically a closed-loop feedback system, with a forward portion of relatively low accuracy. An attempt is therefore made to get accuracy by using a high-accuracy feedback loop. Fortunately you can do exactly the same thing in the simulation. You can use a relatively low-accuracy analog forward loop and then put a high-accuracy digital feedback loop around this and thus get good overall accuracy.

McLeod—Thank you, Bob. Bob has briefly outlined one reason why we want to tie analog and digital equipment together. Now I believe Larry can give you some quite different reasons for combining techniques.

Silva on Problems of Combined Computation

Larry Silva—It has been my experience that when you tie analog-digital equipment to a real live system with 20 to 30 inputs you run into real difficulties because there isn't a digital computer available with a fast enough clock rate. The digital computer just can't physically handle the data. As an illustration, we regularly use some analog-to-digital conversion equipment that spews forth anywhere from 100 to 80,000 digits per second. At the higher rates all computing equipment is bogged down. If you have to do a couple of computations on each input, which will take from 2 to 5 word times, and there are 20 inputs, that may mean 100 word times between successive sampling periods. Now according to Shannon's theorem, you must sample at least twice for the highest frequency components. This places severe limitations on the real systems that you can tie a digital equipment to. If, however, the data inherently exist in the analog domain and you follow the philosophy set down by others of this group and use a combination of analog and digital techniques, you must have some amplifiers before you get into the digital domain. Our present thinking is that for every analog amplifier which you must thus go through, you should do as much as possible before going into the digital domain. In this way we get the analog equipment to do scaling, addition and subtraction and other operations for which it is ideally suited, and relieve the digital computer of some of the work it would otherwise have to do. The combined system can thus be operated in real time.

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*Define "think"!—Your Ed. doesn't know what it means—literally!

The National Simulation Council will meet Wed.-Thur. afternoons, Nov. 28-29, at the Trade Show Bldg., 500 Eighth Ave., New York, N. Y., in conjunction with the Third International Automation Exposition. Each of the four Councils will hold one of four afternoon sessions. The Eastern S/C will have a morning meeting at Project Cyclone on Thur. Nov. 29. See opposite page for tentative program.

McLeod—Thank you, Larry. Your reasons are quite different from those which made Bob Leger want to combine the systems. However, in both cases the two techniques have been combined to do one job. Frank has had experience in using the two to complement each other in a different way. Will you tell us something of your work Frank?

Richmond on Auxiliary Uses of Digitals

Frank Richmond—As you know, originally the only way of checking analog computation was to solve the problem some other way, either by hand or by the use of a digital computer. This is of course not using the techniques in combination. However, it is possible to program a digital computer to analyze analog data almost as fast as it can be computed, and perform checking this way. Often this checking is only partial, but it is possible to program a checking procedure so that when analog data is fed into it, plots can be obtained. This is the principal application with which I have had experience.

As analog computers get more complex other applications are obvious: for instance, programming a problem for an analog computer. There are many operations suitable for digital computers which are now being done by people with desk calculators, such as computing scale factors, coefficients, and so forth. And a lot of checking can be done in advance by computing what you expect to get. This sometimes involves considerable calculation which could be done more quickly on a digital computer.

Another important use for a digital computer is determining from the results of one run what should be done in the next. Analog programs requiring such computations can be speeded up a good deal by the use of digital computers. Thus the analog doesn't have to sit idle while the conditions for the next run are computed by hand or on a desk calculator. A digital computer to be used as I have outlined need not be large as a computer capable of solving the entire problem, but it should be constantly available.

McLeod—Thank you, Frank. In the paper preceding this discussion Jerry Greenstein (Convair-Astronautics, San Diego) described some of the very expensive, very special-purpose equipment which we hope to use to tie the Convair analog and digital computers together. In contrast to this, Dave Prince has been doing some work on analog-to-digital conversions with the kind of standard laboratory equipment which might be available to any of you. Dave's conversions might not be made with the accuracy and speed of the Addaverter, but I think that some of you might like to do some analog-to-digital conversion with your standard laboratory equipment and will therefore be interested in hearing about Dave's work.

Prince on Conversion with Available TIMs

Dave Prince—At Georgia Tech a large digital computing center containing an ERA 1101 and an IBM 650 has recently been established. We also have a 40-amplifier analog computer facility with associated nonlinear components. Last year we built and demonstrated a successful analog-to-digital converter which plotted curves on a stack of IBM cards. Of course there is standard equipment on the market to do this, but our device did work on a novel principle.

Tentative Program of National S/C Meeting, Nov. 28-29:

Wed. Nov. 28: 1300—Midwestern S/C meeting; features of the new simulation center being built for WADC.

1545—Western S/C; program to be announced.

1700—Cocktail party and social.

Thur. Nov. 29: 1300—Southeastern S/C; program to be announced.

1545—Eastern S/C Program: Simulation of Time Delays. See note on opposite page for Project Cyclone trip.

Just this past week we demonstrated a simple means for obtaining analog-to-digital conversion on our analog computer. To do this we used only our standard analog equipment and a time interval meter. The idea is quite simple. When we push the compute button a linear time sweep is initiated. When the amplitude of this linear sweep reaches coincidence with the DC voltage of interest it stops the time interval meter. The time interval meter counts the microseconds from the start of the sweep to coincidence and thus produces a number proportional to the DC voltage. In our experiments last week we obtained accuracy of the order of 1/10 of 1% with the sawtooth sweeping at the rate of 100 volts per second. Of course this data rate is not adequate to feed a digital computer, but it could feed some sort of digital readout or card punch, or be used as a digital voltmeter. We plan to go further into the converter problem, but as our laboratory is newly-established we have not yet been able to.

Prince Raises Question of Accuracy

If it is OK, John, I'd like to ask a question: In view of the somewhat restricted dynamic range of the operational amplifier and the finite noise level, I would like to know how many binary digits it is practical to carry along in the digital part of a combined problem.

McLeod—Eric Weiss?

Weiss—Roughly, carry twice as many binary bits in the middle of a complicated computation as you need in the answer for the accuracy you want. I have had incoming data of 8 or 9 bits. We had the digital machine carry 16 bits, and the output was good to one part in 8 bits, or one part in 256.

Silva—I can give you some specific answers in the low-level area. In the range of 10 microvolts and a few hundred cycles per second we regularly observe dynamic ranges of 20 to 30,000 to 1. Now Joe over here may be able to give us a feel for what the dynamic range is when the signals are at much higher levels, as in an analog computer.

Hussey—It is my personal opinion that one part in 10,000 in a high-quality machine is not out of the question. The problem is not so much accuracy, as people would have us believe, as it is bandwidth. For years people have been listening to their phonographs with a very restricted bandwidth. To get better reproduction they built a better speaker system. This would correspond to our building a better amplifier. We finally found in hi-fi that we must have the low frequencies handled by one system and the high frequencies by another. Basically this is what Bob Leger was talking about; they plan the digital machine for the low-frequency components and the analog for the higher. Thus they will have a combination which will cover a very wide band.

Silva—You are talking about bandwidth, but as I understood it Bob Leger was talking about increased accuracy. I wish someone would clarify for me the value of the increased accuracy in view of the fact that you derive all of this information from analog transducers.

Leger—I think maybe I can answer. It goes back to the idea that the analog portion of the simulation is used to represent the forward loop of your system. If the accuracy here is all you want you could leave out the feedback loop. The feedback loop enables us to take an inaccurate output, measure the inaccuracy against some reference which might be digital, and then use this for correction. With respect to dynamic range, we set up our specification with this problem specifically in mind. When we first looked at our problem we divided the maximum error we could tolerate by the maximum value that the function might have, and wound up with a figure of one part in 100,000. We knew right away that if we went to some manufacturer of converting equipment and asked them to design equipment accurate to one part in 100,000 we wouldn't get anywhere.

However, the system we wish to represent is a feedback system which is trying to cause some quantity to approach zero. This quantity may go through a wide dynamic range, but the important thing is to approach zero with great accuracy. So we concluded that we could tolerate a nominal error while the signal was large, but as the signal got smaller we had to have greater absolute accuracy. So we wound up with a specification that accuracy should be 1/10 of 1% of the actual voltage *or* one millivolt, whichever is larger. This gives a dynamic range of one part in 100,000 but at no place do we specify accuracy greater than 1 part in 1,000. The equipment Epsco is building for us is supposed to be better by a factor of 2.

McLeod—A while ago Larry Silva mentioned that according to Shannon you must sample at least twice per cycle of the highest frequency. I would like to point out that this must be the highest frequency present, not the highest frequency of interest.

Silva—I can clarify that. Shannon's theorem assumes that you have information in a certain bandwidth and no information outside that. However, if you have a 3DB bandwidth and a 6DB per octave roll-off and you analyze the error in the conversion, or the sampled data process, you will find that in order to get 1% RMS accuracy you need something like 1,000 cycles per sample of the 3DB frequency.

McLeod—In other words you too are looking for that perfect filter.

Silva—This is a reality of life. However, this assumes that all frequencies over the bandwidth are equally important. In most physically realizable systems this is not true, so 1,000 samples per cycle is a bit too stringent; you need not go to quite these extremes.

Weiss—We have been talking about accuracy, which reminds me of a problem we had at Hughes. Essentially we had a radar giving a picture on a scope. On the same scope we wished to put a reference map and information coming from a computer. We would compute deflection voltage on the scope in a completely analog way, which is certainly good enough because the radar isn't any better. But we could not index the radar data and the computer data. We had to get the two dots on top of each other because they were the same airplane. What we had to do was take the shaft rotation, go from that to a number, and then go from the number to the sine and cosine of that number, take the sine and cosine numbers, go back to voltages, and display these as a position on the scope. And we had to do that to 12-digit accuracy to match the computer within eyesight, even though the data wasn't that good by far.

I would like to take issue with something Larry Silva said about putting analog amplifiers in front of digital equipment to relieve the crowding of the digital equipment. This is OK, but there are other ways of doing it. For one thing, you can put special-purpose digital equipment in front of general-purpose digital equipment. In other words we can digest some of the digital data in the special-purpose equipment before we put it into the general-purpose equipment. This usually is cheaper than doing it analog-wise.

Silva—Eric, I would like to clarify this. Most of the equipment available requires minimally one amplifier ahead of the converter. We are forced to have that amplifier because of impedances or other considerations, and I say we should utilize it as much as possible. I was referring to those amplifiers which are inherently a part of the conversion equipment.

Weiss—In that case I can't argue with you.

McLeod—Now you have an idea where the talents and interests of the panel lie. Has this engendered any comments or questions from the audience?

Pantazelos Asks About Recent Trends

Peter G. Pantazelos (MIT, Cambridge, Mass.) asked for comments on the application of some of the specialized computing techniques developed during the past year.*

Weiss—The trend goes in two directions.

We try to eliminate access time. Most of the time of a general-purpose digital computer is wasted in trying to locate the information you need in the memory, and finding where to put the answer. If you do not have any access time you can do a complete three-dimensional coordinate conversion problem in one millisecond at the basic rep rate of only 120 KC. I did this as early as 1951.

The other trend is to speed up the basic clock rate, recently to about 4 megacycles.

Silva—When a general-purpose computer is fed by the Addaverter or any other conversion system our problem lies in the extremely difficult time we have communicating with the arithmetic unit. We are usually forced to go to an intermediate buffer storage which slows things up. I feel that this is an area where we must change the general-purpose machines. (Addressing the audience) Do you have any other ideas in mind?

***We are sorry but Mr. Pantazelos' and some of the other comments from the floor failed to register with our electronic secretary.**

McLeod—Dr. Skramstad, do you have any comments on that?

Harold Skramstad (National Bureau of Standards, Washington, D.C.)—I think Larry may be referring to some work done on a project called the DART, which is essentially a digital computer without a memory. You patch information around as in an analog computer. You have a little black box that is a summer and another little black box that is an integrator or multiplier, but each of these would be filled with digital gear, and only pulses would be passed from one box to another. Most people first think of the tremendous amount of equipment required by this arrangement. You essentially have a separate arithmetical unit in each box, but this is an approach which will give the extreme speed necessary for real-time simulation. I think we have almost reached the stage where it is feasible.

Weiss—It is not only feasible—it has been done. In the general-purpose digital computer we use about 5% of the total equipment to do arithmetic and the rest to control that 5%. If you cut the controlling you might be able to do 20 times as much arithmetic and still come out with about the same bill for a special-purpose computer.

Silva—In some of the equipment with which I am familiar we use a core memory and assign a particular row in each core for each variable, and time-share the high-speed arithmetic unit among these variables. Thus we overcome the disadvantages of the drum and slow-speed memories.

Weiss—There is an argument against sharing arithmetic units. Digital equipments *do* give trouble occasionally! In time-sharing, if something goes wrong it is difficult to know what. And until you have found out you must shut down your process. In military operations you can't do that. The practice has been to get rid of time-sharing and duplicate equipment 20 or 100 times if necessary. With present-day techniques you can make it small enough to fit into a trailer or an airplane.

Sampling Vs Accuracy

Someone* asked about the relationship of sampling frequency, bandwidth, and accuracy.

Silva—There is a theoretical analysis linking the sampling frequency, the breakpoint, and the DB per octave roll-off. At 18 DB per octave you have got 1% RMS accuracy at something like 10 samples at the breakpoint frequency. He** is right—if you can somehow filter your information to get an 18DB roll-off or greater then you don't need to sample at such a high rate in order to get 1% RMS accuracy.

Same Someone—I believe that in a recent publication Mr. R. A. Runyan of Electro-Mechanical Research discussed this aspect of sampling frequency.

Low on Statistical Studies and Data Reduction

Henry Low (Ramo-Wooldridge Corp., Los Angeles, Calif.)—Bob Leger has pointed out very well some advantages of a combined simulation. A point I would like to make concerns statistical studies. In the presence of noise you usually run 50 to 100 solutions. If you do this on a digital computer and are not working in real time, instead of taking 5 minutes you might take 15 or so. Imagine the time element involved!

Another point is that as long as you have this conversion equipment anyway, you might consider some open-loop applications, as for instance in data reduction. All you need is the usual standard tape recorder and you can do your cross-correlation or autocorrelation easily by taking the analog information from the tape and feeding it to the digital computer.

Leger—I agree. Certainly there are many open-loop things that could be handily and easily done if you had such a facility. One would be to take some of your data, run it into one of these converters, and plot the output directly on an xy plotter. You would have your data plotted in analog form while you were making the runs.

Insofar as the noise analysis goes, this brings in an economic factor, which is certainly important. There are other techniques which you can use if your system meets certain requirements. If the statistics of your system are nearly stationary, or if you take a certain piece of the run which is so short that the statistics do not change appreciably, you can in one sample get enough information (by the adjunct method) to economize greatly.

---

*Electronics—BOOOO!

**The gentleman the electronic secretary went out without!

MAY MEETING OF EASTERN s/c AT NBS ON "ANALOG-TO-DIGITAL CONVERTERS"

Approximately 68 members representing 35 organizations attended the Eastern Simulation Council's May meeting at the National Bureau of Standards in Washington to talk about "Analog-to-Digital Converters".

Taback on Analog-to-Digital Converters

Leonard Taback (National Bureau of Standards, Washington, D.C.) introduced the subject and gave examples of both analog and digital representation, indicating that analog quantities are continuous, whereas a digital representation is discontinuous and may have only a finite number of values.

Some of the factors to be considered in choosing analog-to-digital conversion equipment, Mr. Taback said, are:

1. Accuracy
2. Speed
3. Form of required data (serial, parallel, binary, etc.)

Gordon on DATRACs

Bernard Gordon (Epsco, Inc., Boston, Mass.) described the characteristics of the Datrac B Voltage-to-Digital Converter. These, which have appeared in these pages before, are given as:

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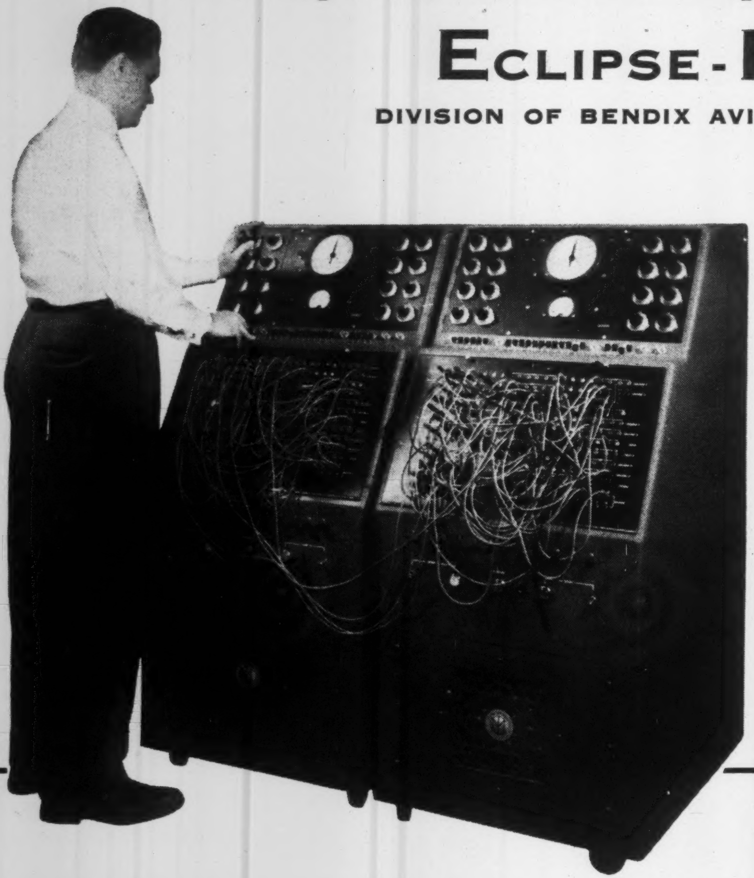

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2. Accurate Current Source—0.1%

Hurney on DACL Techniques

Paul Hurney (Hycon Eastern, Inc., Cambridge 42, Mass.) described equipment developed at the Dynamic Analysis and Control Laboratory, MIT, for the solution of differential equations using combined analog and digital techniques. He described two interesting systems, the basic elements of one of which are:

1. Magnetic drum
2. Digital-to-analog converter (DACON)
3. Coincidence detector
4. Gate
5. Storage register
6. Digital-analog multiplier

The precision of this system was given as 0.1%. A block diagram of one channel is shown in Figure 1.

The magnetic drum rotating at 125 rps is the information storage unit. Though only one channel is illustrated, a typical drum has provision for the storage of seven functions, a ramp function and several timing tracks.

The DACON converts parallel binary-coded information to analog form by means of a series of accurate current switches driving a resistance ladder.

The coincidence detector is a zero-sensing element. The ramp signal from the drum varies from −100 volts to +100 volts in one drum revolution, i.e. 8 millisecs. It is converted to an analog voltage by the DACON and when this voltage equals x, the input voltage, the coincidence detector generates a gating signal which transfers f(x), in the form of a binary-coded parallel signal, from the drum into the storage register.

The digital-analog multiplier is a unit which has an analog input v, and a parallel binary digital input from the storage register. The analog output is a product of these two inputs. Figure 2 is a schematic of the multiplier. Ten parallel conductances arranged in binary ratios are switched according to the input from the storage register to give any one of 1024 different values of total conductance. This forms the input resistance to a feedback amplifier, causing it to have a gain between 0 and 1 depending upon the condition of the switches. The eleventh bit from the register controls the sign of the digital multiplication by operating an electronic switch at the output of the multiplier. Since the analog input may have either sign, the overall result is a four-quadrant multiplier.

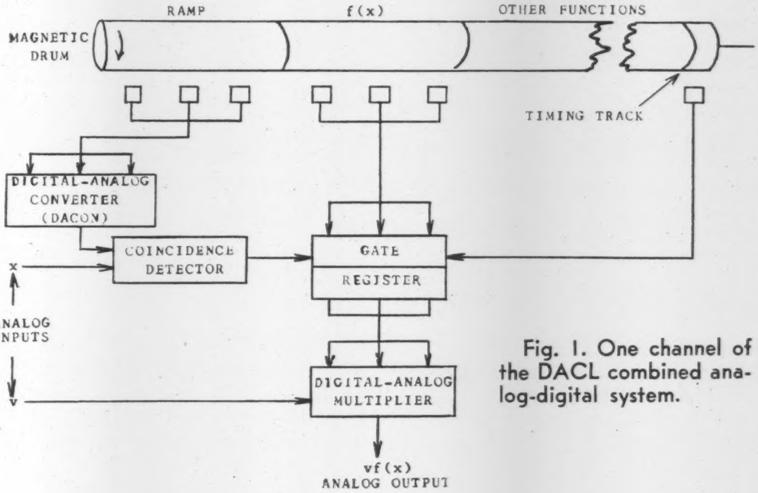

Fig. 1. One channel of the DACL combined analog-digital system.

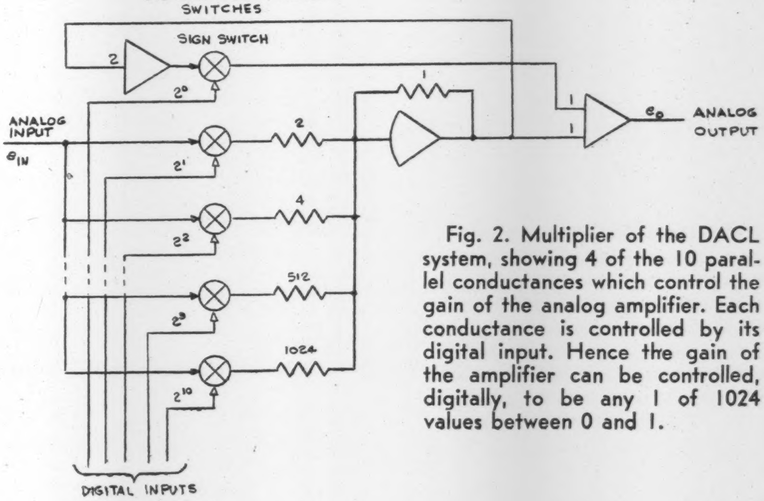

Fig. 2. Multiplier of the DACL system, showing 4 of the 10 parallel conductances which control the gain of the analog amplifier. Each conductance is controlled by its digital input. Hence the gain of the amplifier can be controlled, digitally, to be any 1 of 1024 values between 0 and 1.

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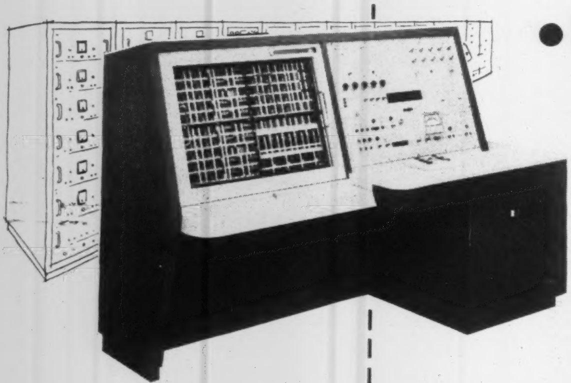

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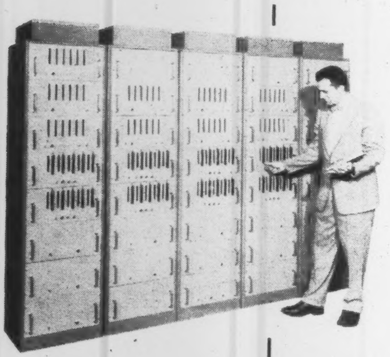

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R. Smith on the ACF Encoder

Ramon Smith (Avion Division of ACF Industries) described the performance and operation of the ACF analog-digital encoder which was conceived in 1953 at the National Bureau of Standards. The encoder consists of three basic sections: (1) The decoder-comparator with 10 precision input gates; (2) The code register, which contains the converted binary number; (3) The digital control circuitry.

The decoder-comparator is a chopper-stabilized d.c. amplifier with back-to-back biased diodes as the feedback. At the summing point are the input and the 10 gates which introduce standard reference voltages through a precision resistor network according to signals from the code register and the digital circuitry.

The analog input is converted to a binary number in 10 successive steps. Starting with the most significant bit, each gate in turn is closed by the code register. If the added reference voltage is too large at any step of the cycle, the output comparator becomes positive, and a comparison pulse which turns off the unwanted bit is generated.

The digital circuitry consists of a 10-stage ring counter, a 10-stage code register, diode gates, a clock pulse generator, run-halt flip-flop, comparator pulse generator, and serial output flip-flop and cathode follower. The ring counter and the clock pulse generator control the encoding operation cycle. The binary number is represented by the state of the code register flip-flops at the completion of the cycle. The register is cleared out by the run-halt flip-flop at the beginning of each new cycle.

Specifications of the ACF Model 1050 Voltage Encoder are:

Accuracy: Error less than ½ the least significant bit which represents one part in 1024
Speed: 0 to 15,000 10-bit codes per second
Full Scale: ± 1.5 volts
Input Impedance: 1000 ohms
Output: Serial pulse train

B. Smith on Cascade Encoding

B. D. Smith (Melpar, Inc.) described a method for converting analog signals to digital form by cascading two or more coding systems. The overall response time is limited only by the response of the individual stages. No sampling, timing, counting or other such operations usually associated with electronic analog-to-digital conversion systems are necessary.

Figure 3 illustrates one coding stage. The decoded output differs from the input by some amount, called the quantization error, because the output is limited to one of a finite number of levels whereas the input is not so limited. If this difference signal is made the input to another similar coding system, additional useful binary digits can be obtained beyond those available with one coding system.

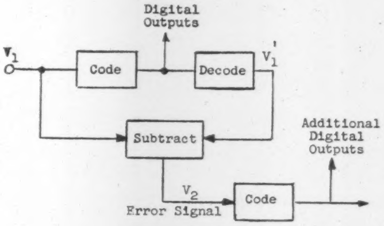


Fig. 3

Figure 4 shows a block diagram of a system made by cascading three coding stages. The first one-bit coder-decoder accepts the input signal, determines the first (most significant) bit, and provides a two-level first approximation to the input signal. The difference between the input and this first approximation is fed to the second one-bit coder-decoder. This process can be repeated through as many stages as desired. Each stage generates one binary digit and a signal to the following stage. Thus an n-digit coding system is made by cascading in relatively simple one-bit coding systems.

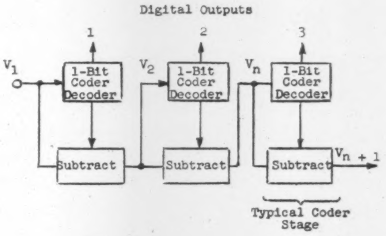


Fig. 4

The properties of each stage of this coder can be specified in the form of two transfer functions of input-output relations as shown in Figure 5. The first transfer function specifies the desired relation between the digit output D_n and the input voltage V_n, i.e.

$$D_n = \frac{0 \text{ if } V_n < A}{1 \text{ if } V_n \geqslant A}$$

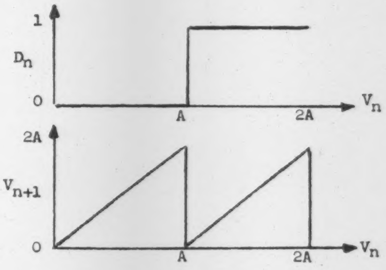


Fig. 5

The reference A is an arbitrary constant equal to one-half of full scale of the coder. The second transfer function specifies the desired relation between the input to a stage, V_n, and its output, V_n+1 (which serves as the input to the next stage). This relation is

$$V_n+1 = 2\ (V_n - AD_n)$$

This transfer function has the shape of a sawtooth.

These transfer functions can be achieved by numerous methods. Figure 6 shows one method employing operational amplifiers. The first amplifier performs the function of a one-bit coder-decoder. Its output is zero if the input voltage is below A, and is a positive voltage 2A if the input voltage is above A. The second amplifier combines the output of the first amplifier and the input signal to produce the desired signal to the next stage.

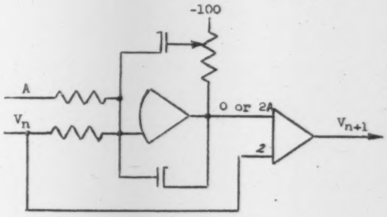
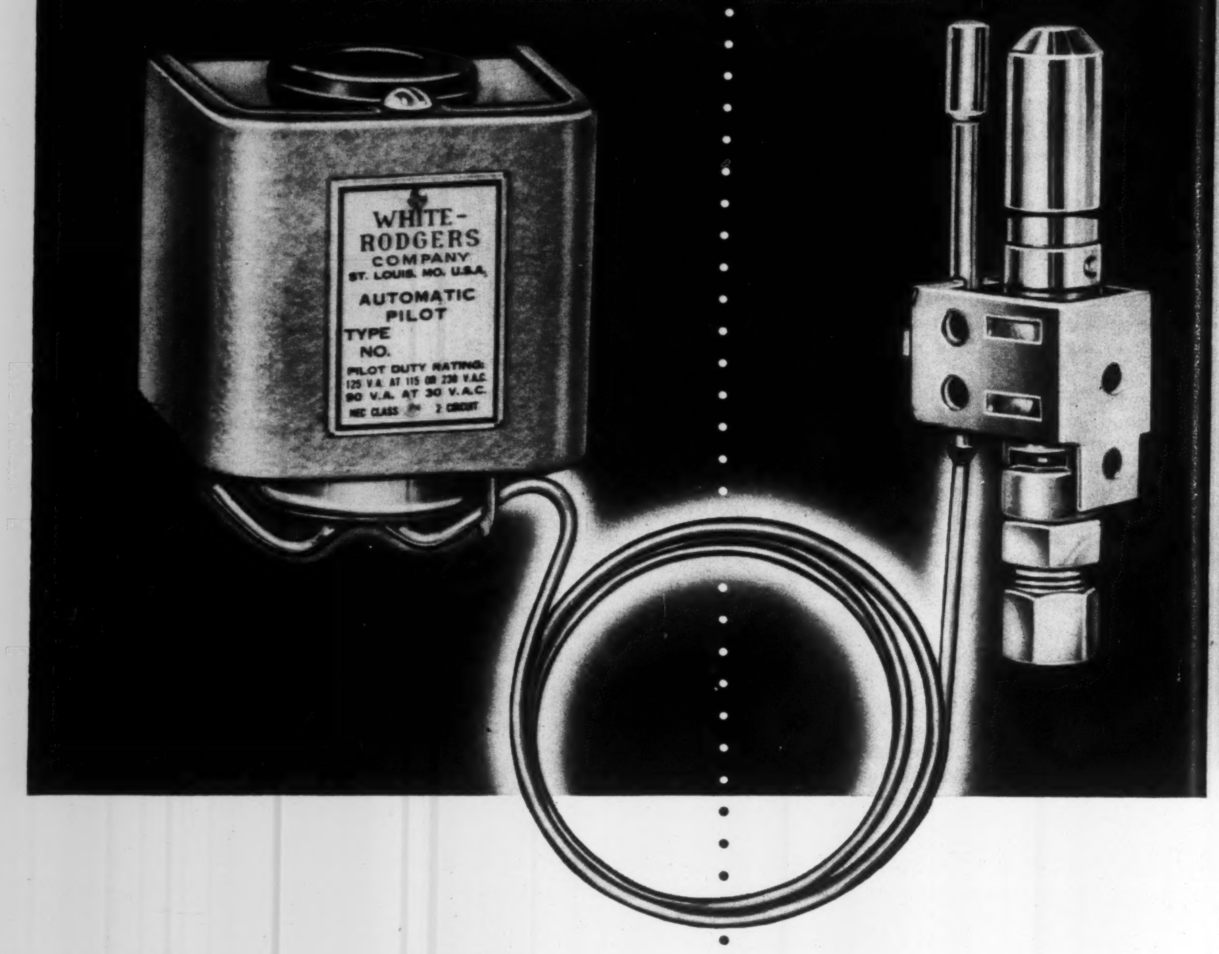


Fig. 6

This basic coding method can also be extended to generate special binary codes such as the Gray code. Furthermore, by feeding the output of one coder stage back to its own input after a delay, a serial code can be generated using the one stage only.

Performance Counts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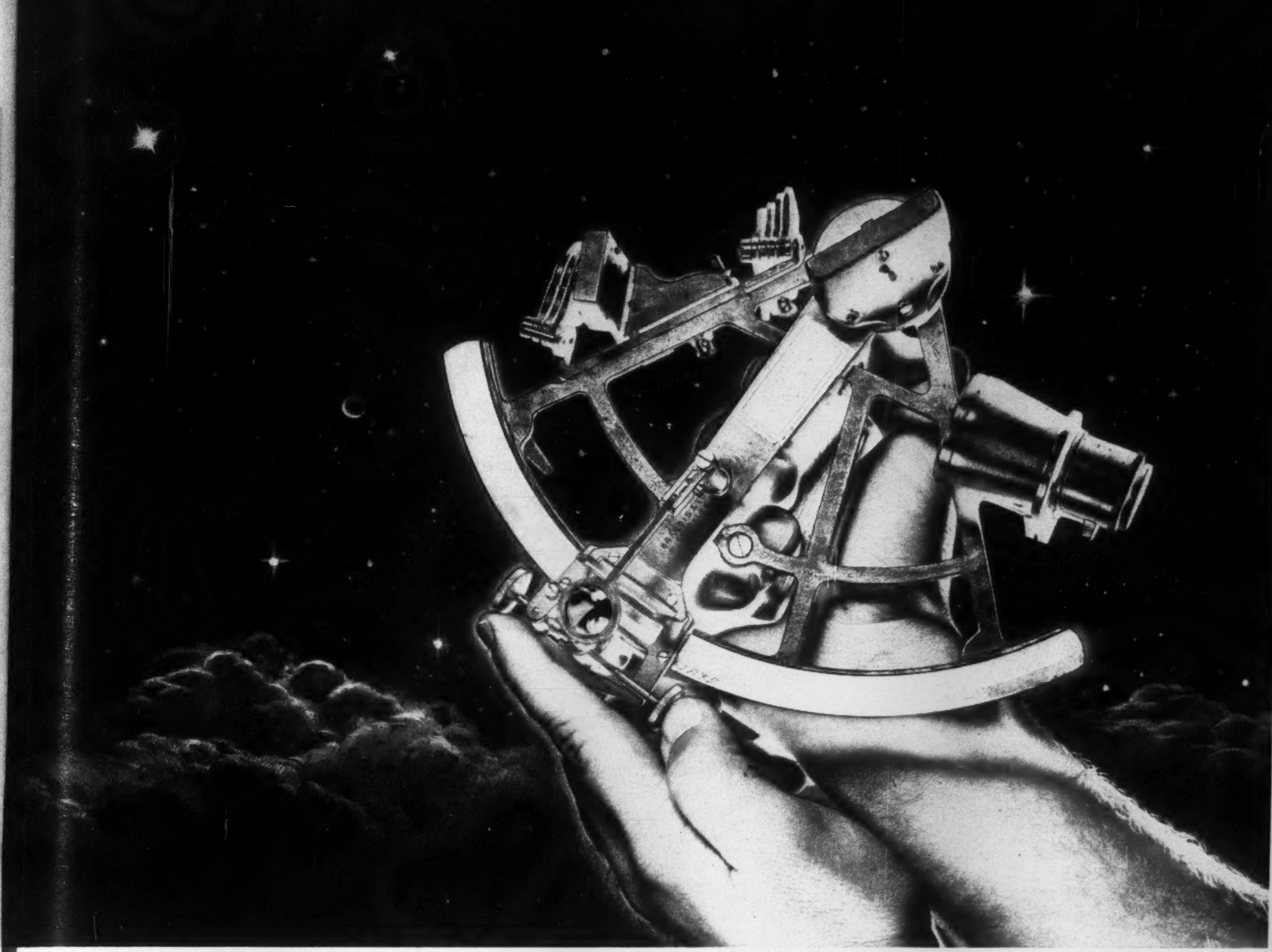

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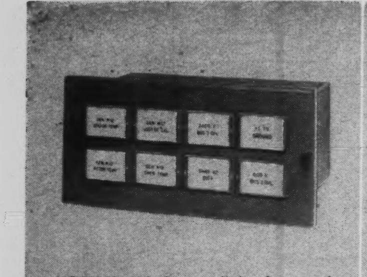
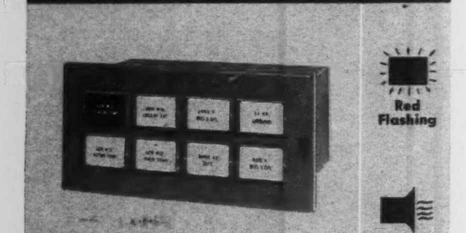
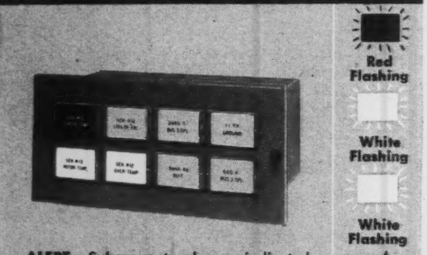


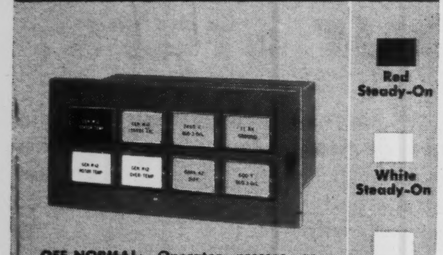
NORMAL: Windows unlighted, no audible alarm.



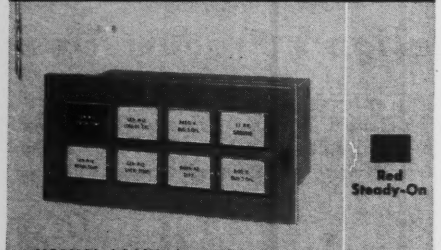
ALERT: Window of first off-normal flashes red; audible alarm. First alarm identifiable with a time difference small as 15 milliseconds between first and following alarms.



ALERT: Subsequent alarms indicated by flashing white windows now added to above condition. Signals lock in on momentary contact.



OFF-NORMAL: Operator presses acknowledgment button, silencing audible signal; visual signals change from flashing to steady-on.



NORMAL AGAIN: As conditions return to normal, white windows drop out, original red signal remains until reset button is pressed.

Panalarm "VS" Annunciator identifies first off-normal from subsequent alarms for rapid corrective action

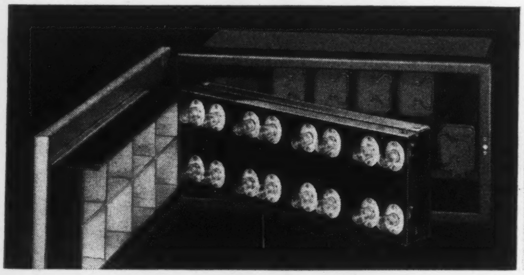
You gain the control advantages of an audio-visual information system, not just an alarm system, with the Panalarm "50VS" Visual Sequence Annunciator. This is particularly valuable when one off-normal condition will cause a "chain-reaction" of off-normals. Typical Panalarm applications are found in the process industries and among users of automatic machinery.

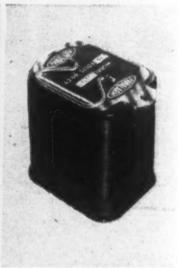
The original off-normal is clearly identified, enabling the operator to take immediate, corrective action. A considerable saving in down-time can often be effected simply by knowing the original source of trouble.

Panalarm "50VS" is completely flexible in setting up various sequential groups. Any number or combination of signals may be grouped as an independent sequence, and the groupings may be changed at any time by simple jumpers on the terminal block. Signals may be either illuminated nameplate or bullseye indicators, combined with a horn, bell or other audible signal. Signaling is simple and positive. A typical sequence is illustrated on the left.

Write for literature on the "50VS" and other Panalarm Annunciator Systems. A Panellit sales engineer will be happy to make a survey of your production operation to determine whether a Panalarm system can help increase efficiency and safety in your plant.

All Panalarm Annunciator Systems are completely modular, permitting future growth and changes. The photographs below illustrate a typical Panalarm Cabinet with illuminated nameplates and the hermetically sealed Panalarm "50" plug-in relay unit. Components throughout are ruggedly built to instrument standards for continuous, dependable duty. Entire Panalarm system is suitable for Class 1, Division 2 installations.





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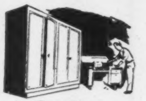
U.S. Patent No. Re-24,031

Engineered Information Systems for Industry



Panalog Information Systems

Graphic Panels Control Centers

Panellit Service Corp.

PANALARM

Division of
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7405 N. Hamlin Ave.
Skokie, Ill.
Panellit of Canada Ltd. Toronto 14

For more information circle **76** on inquiry card.

3rd International Automation Exposition

EXHIBITORS —

— PRODUCTS

New York Trade Show Bldg.—Nov. 26-30, '56

Booth No.

AARD EQUIPMENT CO., Buffalo 5, N. Y. **405**

Exhibiting: Automatic machine and conveying equipment of Planet Co., Barnes & Reinecke, Inc., and others.

AIRBORNE INSTRUMENTS LAB., Mineola, N. Y. **114, 115, 302**

Exhibiting: Special and standardized gaging and control devices; components for machine tools.

ALDEN ELECTRONICS & IMPULSE RECORDING EQUIP. CO., Westboro, Mass. **321**

ALDEN SYSTEMS CO., Westboro, Mass. **321**

Exhibiting: Work Centers; Fact Finders-Timers.

AMERICAN TELEPHONE & TELEGRAPH CO., LONG LINES DEPT., New York 7, N. Y. **334**

Exhibiting: Page Automatic Sending & Receiving Teletypewriters; Receiving-only Typing Reperforators; equipment to be used in connection with demonstration of Bell System equipment for IDP.

In attendance: W. I. Flocken, Communications Engr. (in chg.); Mrs. M. M. Cooper, Misses A. Bobotis and J. T. Butler, Serv. Reps.; W. M. Guest, C. H. Drott, Communications Engrs.

ASKANIA REGULATOR CO., Chicago 11, Ill. **108, 111**

Exhibiting: "Electro-jet" units for conversion of low-level input signals to hydraulic power for production of thrust or torque in control systems.

ASSEMBLY PRODUCTS, INC., Chesterland, Ohio **106, 107**

Exhibiting: New Products—LIAD multi-contact meter-relay for telemetering, max.-value-reading, analog-to-digital conversion, etc. Thermistor-actuated controls, alarms, and indicating pyrometers. New Simplytrol and Versatrol controls, and rugged-sealed 2½" clear plastic case panel meter. **Regular Products**—Contact meter-relays, APL panel meters, Simplytrol temperature controls, indicating pyrometers, VHS relays, Versatrol automatic controls.

In attendance: John Saint-Amour, V. P.; Robert E. Jones, Prod. Mgr.; Robert Pugsley, Asst. Sls. Mgr.; Lloyd Rowe, Paul Saint-Amour, Sls. Engrs.; Lionel Glauberman, Asst. Chf. Engr.

ATMOSPHERE CONTROL CO., INC., Philadelphia 43, Pa. **519**

Exhibiting: Controlled atmosphere test enclosures.

THE AUSTIN COMPANY, New York 11, N. Y. **553**

Exhibiting: New Products—Digital data recording system, accepts 100 channels of analog voltage (0 to +30 mv) information, sequentially tabulates the proportional digital value (0 to 10,000) for each channel speed 2 channels per sec nominal. Max. error 2 counts. **Regular Products**—Shaft Position Quantizer (Analog to Digital Converter); data recording systems; servo systems.

In attendance: C. L. Foster, V. P. & Div. Mgr.; A. H. Kuhnel, Asst. Div. Mgr. & Div. Engr.; W. G. Birkel, R. E. Schram, J. R. Poole, Proj. Engrs.; R. T. Callais, Asst. Div. Engr.

AUTOMATIC CONTROL ENGR. CORP., Westwood, N. J. **510**

AUTOMATIC TEMPERATURE CONTROL CO., INC., Philadelphia 44, Pa. **166, 167**

Exhibiting: New Products—Atcotran Demodulator—no vacuum tubes used in circuit. Atcotran Vertical Scale Indicator for ATC differential transformer system. Proximity Fuse, based on ATC system, has possibilities in nuclear reactor field. **Regular Products**—Atcotrol—automatic reset timer; Atcotran—differential transformer transmitters and receivers; Atcotronic—electronic timers; timing devices.

In attendance: R. B. Seidel, Pres.; W. W. Winters, V. P.; A. N. Clark, Adv. Mgr.; H. J. Oursler; J. Ash, Asst. Sls. Mgrs.; R. H. Kimber, Adv. Sls.; E. A. Wurster, Sls.; W. D. MacGeorge, Dir. of Eng.; W. B. Shinn, Chf. Engr.; R. Neill, Engr.

AUTOMATION ENGINEERING LABORATORY, INC., Greenwich, Conn. **541**

Exhibiting: Special automated machines for candy manufacturers, electrical hardware specialties, leather trade, pharmaceutical, paper box and automotive industries.

In attendance: Richard S. White, Pres.; George F. Hawley, V. P.; John W. Sheppard, V. P.; Allen Howell, Sr. Stf. Engr.; Herman Baer, Ch. Engr.; Ray Long, Control Engr.

AUTOMATION INDUSTRIES, INC., Cockeysville, Md. **440**

AUTONETICS, A DIV. OF NORTH AMERICAN AVIATION, Bellflower, Calif. **134, 135**

Exhibiting: Inertial navigation systems; flight control systems; armament control systems; airborne Instrumentation; digital and analog computers.

In attendance: D. D. Acker, Asst. to Mgr. App.; W. R. Rishebarger, Gen. Supvr., Art & Publications; R. F. Geiger, Chf. App. Engr., Computers & Controls; H. M. Smith, App. Engr., Special Products; B. Van Houten, Customer Relations Rep., Fire Control Systems; L. J. Singleton, Customer Relations Rep., Inertial Navigation Systems.

AXLER ASSOCIATES, INC., Corona 68, L. I., N. Y. **168**

Exhibiting: New Products—Spectroscopic Analyzer & Processor; Optical Linear Wedge Filters; Interference Transmission Filters; Photo-Multipliers.

THE BAKER COMPANY, INC., Maplewood, Maine **408**

Exhibiting: New Products—Ultrasonic Cleaner—Models GW-4, GW-5; Air flow Ball Bearing Torque Tester; Instrument Ball Bearing Tool Kits. **Regular Products**—Sterilshield pressurized dust-free workspaces; torque tester and comparator; ball bearing torque tester.

In attendance: A. K. Baker, Pres.; E. M. Baker, V. P.; Frank A. Potenzo, Design Engr.; Malcolm Parsons, Instr. Frmn.; Joseph Feeley, Purchasing; B. J. Baker, Receptionist.

E. W. BALLOU, Trenton 2, N. J. **132**

Exhibiting: products of Heinemann Electric Co.

BALDWIN-LIMA-HAMILTON CORP., ELECTRONICS & INSTRUMENTATION DIV., Waltham 54, Mass. **542**

Exhibiting: Electronic systems and instrumentation for automation process control; Torquemeters and torque transducers; Load and pressure transducers.

In attendance: Howard Nielsen, Sls. Prod. Mgr.; Jim Howard Appl. Engr.; Samuel Ochlis, Sls. Prom. Mgr.; Al Shore, C. T. Moyer, J. Strickland, L. Moffett, R. M. Stuart, R. M. Kinney, Sls. Engrs.

BARNES DEVELOPMENT COMPANY, Lansdowne, Pa. **307**

Exhibiting: New Products—Sorting bridge for "multiple-class" sort of resistors; sorting mechanisms; **Regular Products**—Data recorder; deviation bridge; sorting bridge.

In attendance: George W. Barnes, Pres.; Edward N. Osten, Elec. Engr.; Raymond E. Fannestock, Designer.

BECKMAN INSTRUMENTS, INC., DATA & CONTROL SYSTEMS DEPT., Fullerton, Calif. **315**

Exhibiting: New Products—Model 112 Automatic Data System which measures, monitors, and processes data automatically; features new components; "Madic" magnetic digital control logic, transistorized analog-to-digital converter, transistorized preamplifier.

In attendance: Frank Scheufele, Sls. Mgr.; Hank Stover, Sls. Engr.; Taylor Fletcher, Mgr. of Data and Control Sys. Dept.; Larry Silva, Dir. Res. & Dev.; Howard Preston, Les Chapin, Engrs.

BELL AUTOMATION CORP., subsidiary of Bell Aircraft Corp., Rochester 7, N. Y. **306**

Exhibiting: "Electro-Way" products.

In attendance: F. S. McCullough, Gen. Mgr.; Ed F. Dunford, Sls. Mgr.; Donald B. Ladd, Bradley C. Gardner, Sls. Engrs.; Thomas Goslin, Ch. Engr.

BENDIX COMPUTER DIV. OF BENDIX AVIATION CORP., Los Angeles 45, Calif. **424**

Exhibiting: New Products—G-15D general-purpose digital computer with a DA-1 digital differential analyzer accessory which enables G-15D to perform as general purpose machine, and as dda. **Regular Products**—Magnetic-drum recording heads.

In attendance: O. P. Staderman, Dir. of Mktg.; R. A. Sweet, Eastern Reg. Mgr.; V. A. van Praag, Western Reg. Mgr.; R. E. Walz, So. Western Reg. Mgr.; H. Doyle, Mathematician; F. Adair, Customer Serv. Mgr.; W. J. McGuckin, Adv. Mgr.

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EXHIBITORS, PRODUCTS—CONTINUED

BERKELEY DIV., BECKMAN INSTRUMENTS, Richmond 3, Calif. 315

Exhibiting: New Products—Model 1132 Computer; Model 5692 Digital Flow Indicator. Regular Products—Models 5840 Dual Preset Controllers; Model 7650 Events-per-unit-time meter; Operational Amplifiers; Electronic Multipliers; Servo & Automatic set-up Function Generators; Servo Multipliers and Resolvers; Servo and Automatic set-up Coefficient Potentiometers.

In attendance: John McWaid, Systems Engr.; J. L. Hussey, Mgr. Computer; C. D. Finnell, Sls. Mgr., Computer; D. R. Miller, Sr. Computer Engr.; R. C. Schmidt, Sr. Production Engr.; K. E. Sterne, Appl. Engr.; A. B. McLane, Sr. Engr.

BJ ELECTRONICS, BORG-WARNER CORP., Santa Ana, Calif. 138

Exhibiting: New Products—Digital pressure transducers and system components to indicate, record and control differing physical parameters in chemical processing plants, nuclear power, aircraft and missile telemetering applications, and in jet and reciprocating engine testing. **Regular Products**—UHF and VHF signal generators; slotted lines; incidental frequency-modulation meters; r-f wattmeters.

In attendance: John R. Harkness, V. P.; Grant Corby, Sls. Engr.

NORMAN BRAGAR CO., INC., Newark 2, N. J. 340

Exhibiting Products of: West Instrument Corp., Conax Corp., Ultradyne Engineering Labs., Inc., Hope Electrical Products Co., Inc., Scam Instrument Corp.

In attendance: Norman H. Bragar, Pres.; Mandell Dalis, George T. Reed, William J. O'Connor, Sls. Engrs.

BRANSON ULTRASONIC CORP., Stamford, Conn. 548

Exhibiting: New Products—"Sonogen" ultrasonic generators: Model AP-10B—small compact for bench-top washing of delicate parts; Model AP-25B—for production cleaning of small parts also for experimental work with ultrasonics; Model APT-100—for production cleaning of small and medium sized parts and pilot investigations of ultrasonic processing applications. "Vidigage" Model 14 non-destructive thickness gage. **Regular Products**—Transmission tester, coating-thickness and thickness gages.

In attendance: N. G. Branson, Pres.; P. K. Bloch, Sls. Mgr.; F. W. Hightower, Appl. Engr.; K. P. Hayes, M. Tamas, H. Biagini, E. Varrichio, Sls. Engrs.; W. Bleistein, W. Cronin, R. V. Harris, E. Harris, Engrs.

BRISTOL COMPANY, Waterbury 20, Conn. 301

Exhibiting: New Products—Syncroverter Choppers; Electronic Components; Recording, Automatic Controlling, and Telemetering Instruments; and Socket Screws.

BROOKS ROTAMETER CO., Lansdale, Pa. 532

Exhibiting: New Products—Transi-Twins Pneumatic and Electric Transmitters for use with Brooks Rotameters. Interchangeable units simplify standardization. Transmitter design is repleat with important features affecting in-the-line performance. Regular Products—Complete line of Rotameters.

In attendance: D. N. Brooks, Pres.; N. S. Brooks, V. P. Prod.; S. Blechman, V. P. Sls.; J. T. Aldrich, Appl. Engr.; H. F. Lorence, Adv. Mgr.

BURNDY CORPORATION, Norwalk, Conn. 422

Exhibiting: New Products—"Termatic" automatic machine for terminating continuous strip terminals (6000 terminals per hour); "Sealink" insulated, watersealed splice; "Uniring" one-piece, insulated ferrule for shielded or coaxial cable. **Regular Products**—Bandolug Machine; Insulugs; Hylugs & Hylinks; Nyloclips; Paneloks; installation tooling (hand, hydraulic & pneumatic); connectors for Magnetwire; Unilok gang disconnect panel.

In attendance: S. Bergman, Sls. Mgr., Omaton Div.; A. Aune, OEM Sls. Mgr.; H. Buttner, Military Products Sls. Mgr.; J. Lambert, E. Valehrach, OEM Fld. Engrs.; F. March, Mil. Prod. Sls. Engr.; T. Nestler, Aircraft Sls. Engr., L. Gage, Ad. & Sls. Prom, Mgr.; A. Butkowsky, Asst. Ad. & Sls. Prom. Mgr.; G. Singer, Ad. & Sls. Prom., Omaton.

JOHN CHATILLON & SONS, New York 38, N. Y. 316

COBEHN, INC., Caldwell, N. J. 531

Exhibiting: New Products—Cobehn long-nozzle sprayer for use with Spray-Clean Solvent for the precision cleaning of open relay contacts in computers and other assembled electronic and electro-mechanical components; automatic sprayer for production line cleaning of instrument bearings, jewel bearings, electrical contacts, semiconductors, and other precision electronic and electro-mechanical components. **Regular Products**—Cobehn High-Velocity Spray-Clean Equipment; Spray-Clean Solvent.

In attendance: George L. Henzel, Ch. Engr.; William E. Bellars, Sec.-Treas.; David F. Cook, V. P.-Sls.

COLEMAN ENGINEERING CO., INC., Los Angeles 16, Calif. 122

Exhibiting: Oscillogram Reader to convert oscillograph data into punched tape records for input to computers, as well as type D data for immediate reference. **Regular Products**—Decimal Digitizers; Binary and Binary-Coded Decimal Digitizers,

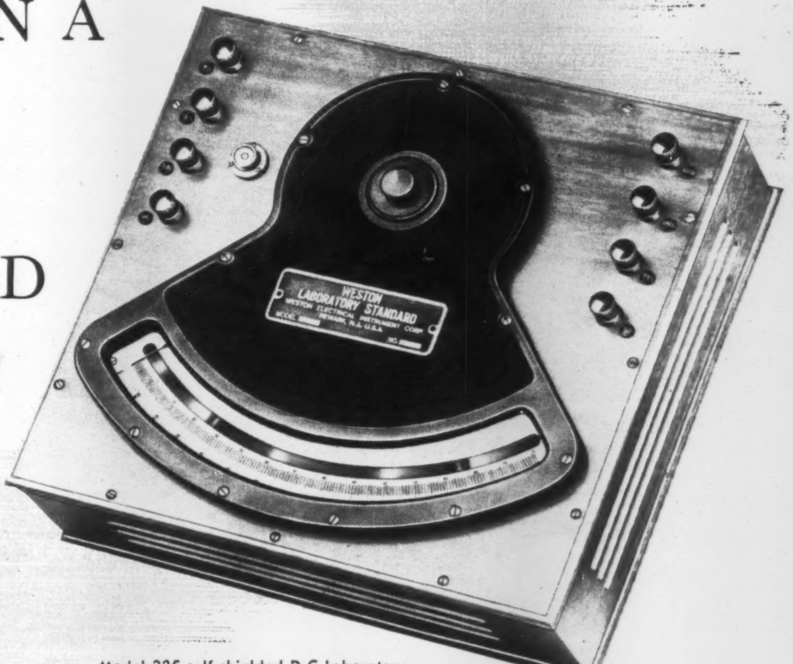
In attendance: Allen J. Edwards, Std. Prod. Mgr.; Neal D. Richards, Clay Anderson, Liaison Engrs.; Roy M. Knox, Supr. Elec. Engrg.; J. Albeck, Proj. Engr.

COMPUTER CONTROL CO., INC., Wellesley 57, Mass. 419

Exhibiting: New Products—Transistorized low-speed computer packages—flip-flops, multivibrators, diode gating structures, etc. **Regular Products**—3C-BLOC and 3C-PAC Digital Building Blocks.

In attendance: Robert W. Brooks, Pres.; William Wolfson, Dir, of Sls.; Robert E. Michaud, Appl. Engr.

NO MEASURABLE ERROR IN A 5 OERSTED FIELD!



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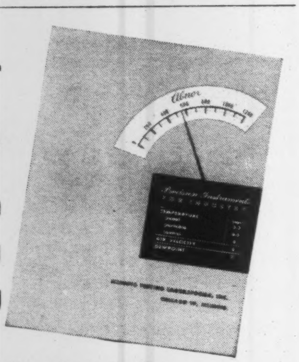

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EXHIBITORS, PRODUCTS—CONTINUED

CONDENSER PRODUCTS CO. DIV., NEW HAVEN CLOCK & WATCH CO., New Haven 4, Conn. **539**

Exhibiting: New Products—Uncased mylar and polystyrene capacitors, bakelite uncased polystyrene and mylar capacitors, high temperature teflon capacitors up to 200 deg. C. **Regular Products**—ASG Plasticon, AOC Plasticon, LSG, PAG, PAC, high voltage d-c power supplies.
In attendance: Richard J. Hesse, Sls. Mgr.; Herbert A. Haworth, Gen. Mgr.; James R. DeSanty, Sls. Engr.; John J. Ahearn, William Gentry, Thomas Murphy, Robert Shine, Engrs.

CONTINENTAL ELECTRIC CO., Chicago, Ill. **546**

COPY-CRAFT, INC., New York 7, N. Y. **327**

Exhibiting: "Ormig" Selective Data Printers for automatic selection of information from one master to be printed on single item tickets.
In attendance: J. H. Smith, Jr., Exec. V. P.; Ray Tompkins, E. M. Simon, W. L Raub, Ormig Systems Engrs.; Herbert Arndt, Chicago Rep.

COUNTER AND CONTROL CORP., Milwaukee 19, Wis. **423**

Exhibiting: New Products—ACRATROLS—Preset, electric counters with settings limited to round numbered multiples useful in general-purpose counting applications. **Regular Products**—Cyclo-Monitors; Programonitors.
In Attendance: Harold J. Geder, Gen. Mgr.; Otto W. Riebe, Sls. & Serv.; Tony Dolan, D. C. Keaveney, H. E. Meader, Sls. Engrs.

COURTNEY AND COMPANY, Philadelphia 3, Pa. **522**

Services: Human Factors consulting and research services as applied to systems analysis (operations research), human engineering (man-machine design), environmental research (workspace layout, personal equipment design), product design based on consumer requirements, and personnel planning.
In attendance: Kenneth Colman, Sr. Res. Assoc.; George Rowland, Fld. Dir.; Douglas Y. Cornog, Res. Assoc.; Elizabeth Bowman, Administrative Asst.; Nannette Menneti, Res. Asst.

CRAWFORD FITTING CO., Cleveland 10, Ohio **502, 524**

Exhibiting: New Products—Swagelok: to Butt Weld Male Connectors; to Socket Weld Unions; to Butt Weld Elbows; to Socket Weld Elbows. New Line of Socket Weld Fittings; Swagelok Bulkhead adapter. Regular Products—Swagelok Tube Fittings: connectors, elbows, tees, unions, adapters, inserts, plugs, caps, reducers, quick connect fittings and thermocouple style male connectors in all machinable metals and plastics; Good Thread Lubricants.
In attendance: F. A. Lennon, Pres.; A. P. Lennon, Treas.; D. P. Haag, Sls. Mgr.

DAGE TV DIV., THOMPSON PRODUCTS, INC., Michigan City, Ind. **130, 131**

Exhibiting: New Products—Data-Vision— "Slow Sweep System" for data or informational material transmission utilizing 8-kc balanced telephone lines. **Regular Products**—Closed circuit cameras with remotely controlled lens turrets, pan and tilt, optical focus, iris and automatic iris; dustproof, weather-proof and explosion-proof housings; binary-type synchronizing generators, video monitors, color cameras and monitors.
In attendance: J. L. Lahey, Gen. Mgr.; John R. Howland, Gen. Sls. Mgr.; J. E. Campbell, Indust. Sls. Mgr.; J. Banister, Systems Engr.; Donald F. Pitts, Dist. Mgr.

DESIGN TOOL CORP., New York 6, N. Y. **516**

DETROIT CONTROLS CORP., Detroit 8, Mich. **346**

Exhibiting: Precision snap switches; mercury-jet switches, automatic pressure and temperature controls.

DIALIGHT CORPORATION, Brooklyn 37, N. Y. **140, 141**

Exhibiting: New Products—Oil-tight, water-tight, dust-tight indicator lights with neon and incandescent lamps for heavy duty industrial applications made to withstand severe shock and vibration. Regular Products—Warning, signal, pilot light assemblies.
In attendance: R. E. Greene, J. Weil, Vice Presidents; M. Greene, G. Weil, Sales.

THE HENRY G. DIETZ CO., Long Island 2, N. Y. **318**

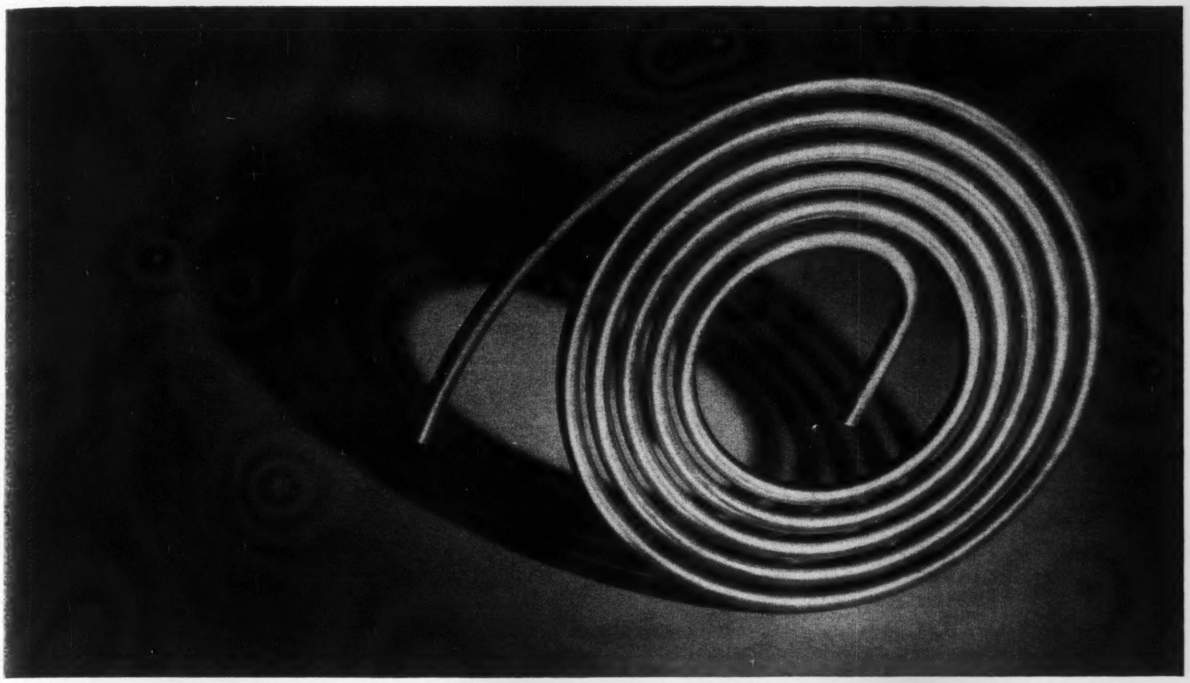
Exhibiting: New Products—Cat. 200 Timed Operations Pre-selector—a multiple-circuit time control apparatus where each time interval is independently and individually adjustable with means for selecting a sequence or cycle of programmed events. **Regular Products**—Air flow switches; sensitive static pressure controls; manometers; timers; vacuum switches.
In attendance: Henry G. Dietz, Pre. & Ch. Engr. Carl F. Hayden, Chicago Sls. Rep.; Gordon Pheasey, John Karman, Jr. Engrs.; Madeline Pheasey, Sec.

DOELCAM DIV., MINNEAPOLIS-HONEYWELL REGULATOR CO., Boston 35, Mass. **125**

Exhibiting: New Products—A variety of electromechanical-devices for industrial and military applications.

ALLEN B. DU MONT LABS., INC., Clifton, N. J. **339**

Exhibiting: Cathode-ray instruments and associated equipment; industrial television.



Superior offers the widest range of sizes and alloys in top quality instrument tubing

Superior Tube Company produces the finest instrument tubing in a wide range of sizes and alloys—offers you as standard products what many makers would classify as specialty tubing.

1. NEEDLE TUBING

The stainless steel links in this recording instrument are made of Superior needle tubing. The high strength, stiffness, and strict dimensional tolerances characterizing this tubing—originally designed for surgical uses—have opened new fields of industrial applications when used as mechanical tubing.

2. PRESSURE AND SUPER PRESSURE TUBING

A spiral windpipe made of Superior 304 cold-drawn seamless stainless steel tubing. Pressure tubes are used to convey fluids at elevated temperatures and pressures. Produced in stainless, carbon and alloy steels in sizes to withstand pressures up to 100,000 psi.

3. BOURDON TUBING

A "C" tube element for a pressure gage. The shaped Bourdon tube serves as the actuating element for the majority of pressure indicating and recording instruments. Helix and spiral elements are also fabricated from the wide range of alloys available at Superior—a range that makes it possible to satisfy any set of conditions in the use of Bourdon tubing.

4. CAPILLARY TUBING

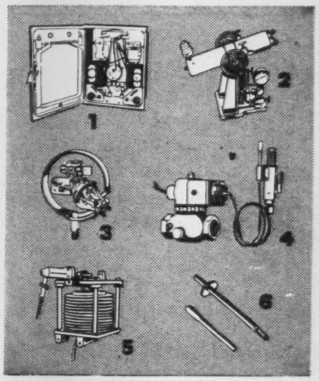
A thermostatic instrument pressure transmission element with a coiled unit made of Superior Type 321, capillary tubing. Superior capillary tubing is used primarily for transmitting temperature and pressure impulses from the source to a recording or indicating instrument. Capillary purposes, in general, require a heavy-wall tube with an ID of .006" to .030". Types 347, 321, 316, Monel* and carbon steels are recommended analyses.

5. LARGE OD LIGHT WALL TUBING

A large OD light wall tubing bellows in a pressure actuating element. Present applications for large OD light wall tubing include bellows, low pressure heat exchanger tubes, flexible hose, aircraft ducting, fractional horsepower motor casings, ceramic drills, and casings for radioactive well logging instruments. Sizes offered up to 2½" OD.

6. MECHANICAL TUBING — INSTRUMENT LINE

Various fabricated parts—all made of Superior mechanical tubing. Superior mechanical tubing can be either seamless or Weldrawn† grade used statically or dynamically, but not subjected to severe temperature or pressure. It is produced in sizes up to ⅝" OD within production limits, in many special shapes, and in over 63 standard analyses and mechanical properties.



Send for free copy of Bulletin 40—A Guide to the Selection and Application of Superior Tubing. Write Superior Tube Company, 1968 Germantown Ave., Norristown, Pa.

Round and shaped tubing available in Carbon, Alloy and Stainless Steels; Nickel and Nickel Alloys; Beryllium Copper; Titanium; Zirconium

Superior Tube

The big name in small tubing

NORRISTOWN, PA.

*Reg. T.M. International Nickel Co.
†Reg. T.M. Superior Tube Co.

All analyses .010" to ⅝" OD—certain analyses in light walls up to 2½" OD

On the West Coast: Pacific Tube Company, 5710 Smithway St., Los Angeles 22, Calif.

For more information circle **81** on inquiry card.

Now Save 36%
On Installation Time
with IMPERIAL Hi-Duty®
TUBE FITTINGS

Just push tube into fitting without removing nut and tighten . . . that's all.

Repeated, thorough tests reveal that IMPERIAL HI-DUTY FITTINGS can be assembled in 36% less time than regular COMPRESSION TYPE FITTINGS . . . and in 71% less time than FLARE TYPE FITTINGS. These are spectacular savings.

Fitting is furnished with integrated nut and sleeve assembled. To get a tight joint, simply insert tube into fitting and tighten nut. No loose sleeve to drop.

MAKES FAR STRONGER JOINTS because sleeve is always in perfect alignment and because its design minimizes deformation of tubing. Hi-Duty Fittings remain leakproof even under severe service; withstand over 5 times as much vibration as ordinary compression or flared fittings.

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THE IMPERIAL BRASS MFG. CO., 1204 W. Harrison St., Chicago 7, Ill.

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INDOX
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POTASSIUM BROMIDE
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STRONTIUM TITINATE
TITANIUM DIOXIDE
*VYCOR
*X-RAY LEAD GLASS
ALL TYPES KNOWN GLASS

*Carried in stock
**Purchased for orders

For more information circle **83** on inquiry card.

EXHIBITORS, PRODUCTS—CONTINUED

DYNAMIC GEAR CO., INC., Amityville, N. Y. **504**

Exhibiting: Precision Stock and Custom Gears.

EASTERN PRECISION RESISTOR CORP., Richmond Hill 18, N. Y. 137

Exhibiting: Wire-wound resistors; plastic compounds; automatic devices.

EDIN COMPANY, Worcester 8, Mass. **345**

Exhibiting: Expandable oscillograph consolette with modular preamps and basic amplifiers; standard oscillograph console units; automatic waveform analyzer.

ELECTRIC AUTO-LITE CO., Toledo 1, Ohio **322**

Exhibiting: Recording thermometers, pressure gages, vacuum gages, compound gages.

In attendance: L. B. Murphy, Sls. Mgr.-Indust. Thermometer Div.; Tom Murchie, R. R. Hopkins, Dist. Suprvs.; Leo Kubiak Salesman.

ELECTRO SWITCH CORP., Weymouth 88, Mass. **417**

Exhibiting: New Products—Solenoid-operated rotary switches. Standard heavy-duty power switches arranged for remote or automatic operation by rotary solenoids. **Regular Products**—Rotary switches: Tap, selector, instrument, control, special purpose.

In attendance: T. K. Brydson, V. P. Sls.; R. E. Getchell, Ch. Engr.; S. C. Lukens, Sls. Engr.; B. H. Ahlers, R. D. Hobbie, J. E. Drake, Sls. Reps.

ELECTRODATA CORPORATION, Pasadena, Calif. **437**

Exhibiting: E101 Computer; High-Speed Printer; Datareader (Magnetic tape unit #544).

ELECTRO-TECH EQUIPMENT CO., New York 13, N. Y. **101**

Exhibiting: New Products—Non-rotable shaft air cylinders from 1" to 60" long; single acting cylinders to 3" stroke length. **Regular products**—Electrical measuring instruments and industrial control equipment including: timers, relays, variable voltage transformers.

In attendance: Arthur Prince, Gen. Mgr.; George Levine, Sls. Engr.

ELECTRONIC ASSOCIATES, INC., Long Branch, N. J. **349**

Exhibiting: New Products—PACE—Precision Analog Computing Systems and associated output equipment. **Regular Products**—Analog computers; Variplotters (plotting board); six-channel recorder.

In attendance: Robert L. Yeager, Eastern Sls. Mgr.; Norman Seiler, Walter Helbig, Edward Schneider, Sls. Engrs.

ELECTRONIC CONTROL SYSTEMS, INC., Los Angeles 25, Calif.
.... **156, 157, 507**

Exhibiting: New Products—"Digimatic" all-decimal special-purpose computer and magnetic tape control for machine tools, with computer programming simplified so shop personnel can enter information directly from blueprint. Model C-100A Statistical Analyzer—for automatic production testing, incoming inspection, and automatic acceleration of statistical data—tests at speeds and accuracies not capable by human labor. **Regular Products**—Continuity tester; Histogram tabulator; amplitude discriminator; special equipment test sets.

In attendance: P. R. Engels, Mgr. Lab. Services; A. F. Brewer, Exec. V. P.; B. Elbinger, Mgr. Spec. Products; E. Hoo, T. Scuitto, W. Broadwell, Members of Technical Staff; E. Spandau, Mgr., Applications Engr.

ELECTRONIC PLASTICS CORP., Brooklyn 7, N. Y. **137**

Exhibiting: New Products—Dispenser for Thermosetting Resins—automatic dispensing machines for epoxides, polyesters, polyurethanes, etc. **Regular Products**—EP-Fome; EP-1014 high temperature epoxy; EP-450 coating compound; EP-223 high temperature modified polyester; encapsulated precision wire wound resistors.

In attendance: Martin Green, Pres.; Hal A. Salzman, Gen. Sls. Mgr.; Dr. B. G. Forman, Res. Dir.; Harvey Fried, Ch. Electronic Engr.; Joseph Sinacore, Sls. Engr.; Miss B. Rose.

ELGIN METALFORMERS CORP., Elgin, Ill. **116, 117, 118**

Exhibiting: EMCOR Modular Enclosure System.

ELGIN NATIONAL WATCH CO., ELECTRONICS DIV.,
Burbank, Calif. **104**

Exhibiting: New Products—"Neomite Relay"—worlds smallest precision relay; "SN" series relay—high vibration type relay with extreme sensitivity; "VG" series relay—high shock & vibration resistance small size relay. **Regular Products**—Electrical relays.

In attendance: A. P. Barton, Gen. Mgr., Electronics Div.; E. C. Carlson, Sls. Mgr., Electronics Div.; F. S. Schaumburg, Sls. Mgr., West Coast Plts.; E. Firth, Relay Sls. Supv.; J. Krack, F. Winter, Sls. Engrs.

ENCYCLOPAEDIA BRITANNICA INC., New York 17, N. Y. **305**

In attendance: J. Wittchen, Mgr.; D. W. Wynkoop, Dist. Mgr.; R. Jacquemot, P. Banker, E. McGovern, Asst. Mgrs.; C. D. Griggs, Div. Mgr.

EPSCO, INC., Boston, Mass. **416**

Exhibiting: Data Processing Equipment & Control Instruments. High-speed analog-to-digital conversion equipment.

ERIEZ MANUFACTURING CO., Erie, Pa. **304**

Exhibiting: New Products—MAGNA-MOVER—a permanent magnetic conveyor-elevator, for magnetically moving all types of ferrous objects

See Autonetics Booths 153 and 415 at The Third International Automation Exposition—New York—Nov. 26-30.

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you can achieve science-fact

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Today at AUTONETICS there are elaborate automatic control systems actually being developed, designed and *produced* in quantity that make the mechanics of the wildest space fantasies look ordinary.

For example, where in the pages of science-fiction is there a robot that compares with AUTONETICS' new airborne digital computer? This 3-cubic-foot brain can solve mathematical problems in one second that would take a math whiz with pencil and paper 9 hours, or require a clothes closet full of ordinary computer equipment. It can continuously integrate 93 quantities simultaneously . . . through 51 removable panels of etched, transistorized circuitry.

This is only one example of AUTONETICS' far-reaching electro-mechanical technology. There are hundreds of other areas of equally advanced opportunity in missile guidance, flight control, fire control and special automatic controls. Among your tools are the latest data processing equipment, plus modern and complete environmental and flight test facilities. AUTONETICS' scientific leadership is setting the pace in this field with its unique 10-year backlog of know-how.

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Contact: Mr. A. Brunett, Autonetics Engineering Personnel Office, Dept. 991-101A, P.O. Box AN, Bellflower, Calif.

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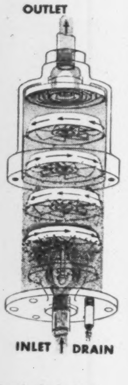
SUPER-CLEANS, SUPER-DRIES
COMPRESSED AIR AND GAS

Engineered to your compressed air or gas line, the ARIDIFIER stops 92% of dirt, oil, scale and water in the air stream. Multi-bladed rotors whirling in opposite directions pick off water and sludge, dash them against vertical walls, from where they drop by gravity into a drain trap. Free of these impurities, air or gas comes out of the ARIDIFIER super-cleaned, and super-dried. Air tools, spray guns, hoists, sand blasters, etc. perform as they should, and last far longer.

Learn how the engineered-to-your-line ARIDIFIER can solve your problem and save you trouble and money. Write for the Aridifier catalog.



Exploded view showing ARIDIFIER operation. Capacities, 7 to 17,000 C.F.M.

Logan ENGINEERING CO.
4921 West Lawrence Avenue, Chicago 30, Ill.

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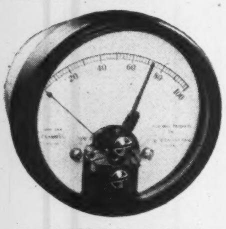
NEW METER-RELAYS
FROM 0-5 MICROAMPERES-UP
Ruggedized-Sealed, Black Bakelite, or Clear Plastic Cases
D'Arsonval indicating meters with built-in locking contacts for sensitive and accurate control or alarm

TRIP POINT ADJUSTABLE to any point of scale arc. Sensitive to changes as little as 1%. One contact carried on moving pointer. The other on an adjustable pointer. When two pointers meet, contacts close and lock. Holding coil is wound directly over moving coil, locking action is electro-magnetic. Reset can be manual or automatic. Spring action in contacts kicks them apart forcefully.



Model 255-C, Single Contact, High Limit, 0-10 Volts DC $42.50

D.C.
MICROAMPERES

Model 461-C, Double Contact 10-0-10 Microamps DC $83.25

Ranges from 0-5 microamperes or 0-5 millivolts up, full scale. Temperature ranges from 0-300°F. (10 ohms external) have bimetal cold junction compensation. **Standard Contact Rating** 5 to 25 milliamperes DC. Can be built up to 100 milliamperes DC. **Ruggedized-Sealed** metal cases are 2½", 3½" and 4½" round, shock-mounted, gasket-sealed. **Black Bakelite** case, 4½" rectangular. **Clear Plastic cases** are 2½", 3¾", and 4½" rectangular. Maximum visibility and lower cost.

Panel meters and indicating pyrometers are also available in ruggedized-sealed, black bakelite or clear plastic cases. New 40-page catalog lists prices and specifications for meter-relays, meters, pyrometers and automatic controls using meter-relays. Write for Catalog 4-A, **Assembly Products Inc., Chesterland 10, Ohio.** HAmilton 3-4436 (West Coast: Desert Hot Springs 10, Calif. Phone: 4-3133 or 4-2453)

For more information circle 85 on inquiry card.

EXHIBITORS, PRODUCTS—CONTINUED

—nuts, bolts, nails, spikes, stampings, metal parts, finished products, cans, caps, etc.; MAGNA-RAILS-permanent non-electric magnetic elements for existing conveyor belts (directly under belt) or incorporated in new lines; HI-VI electro permanent magnetic vibratory feeders to feed and accurately control bulk materials. **Regular Products**—Small diameter magnetic rolls, control plate magnets, magnetic tubes, "V" groove magnetic rolls.

In attendance: R. A., Roosevelt, Sls. Mgr.; M. L. Cramer, Chf., Sls. Eng'ng. Section; Ned Hirt, Adv. & Prom. Mgr.; Jos. F. Kern, John Signafoos, Sls. Reps.

FAIRCHILD CONTROLS CORP., COMPONENTS DIV., Hicksville, N. Y. 308

Exhibiting: New Products—High Temperature Precision Potentionmeters—150 deg. C. wire-wound linear and functional, single and multi-turn types. Pressure Transducers—2" and 3" with single or dual potentiometer outputs; linear or functional outputs available. Sine-Cosine Potentiometers—available in three diameter sizes: 3", 2" and 1¼". 10-Turn Potentiometers (⅞")—resistance range 100 to 100,000 ohms; linearity values as low as 0.25%. **Regular Products**—Precision potentiometers; FilmPots and FilmPot trimmers; pressure transducers, and other components.

In attendance: A. A. Budde, Sls. Mgr.; R. J. Sullivan, Chf. Dev. Engr.; F. C. Weiss, Jr., Sls. Prom. Mgr.; R. Glueck, H. McCann, H. Cashman, E. Breen, H. Avey, Sls. Engrs.; E. Roman, C. Waterman, J. Dougherty, M. Christenson, L. Van Eperin, Sls. Liason.

FALSTROM CO., Passaic, N. J. 448

Exhibiting: New Products—Control boxes, panels, consoles and cubicles. **Regular Products**—Custom-built panel boards, control boxes, consoles, cubicles, and cabinets, relay racks, frames, mountings and stands.

In attendance: M. C. F. Lindholm, Pres.; A. W. Lindholm, V. P.; W. Ricker; C. F. Lindholm II; R. E. Hill, Sls. Mgr.; W. H. Muench, Estimator; J. E. Jensen, J. Santhouse, Sls. Engrs.

FARRAND CONTROLS, INC., New York 70, N. Y. 112, 113

Exhibiting: New Products—Inductosyn Automatic Control Systems for machine tools and military devices. **Regular Products**—Optical tooling instruments and accessories.

In attendance: R. W. Tripp, Ch. Engr.; J. L. Winget, Ch. Electronics Engr.; V. Foster; W. Grace, Electronics Engrs.; D. A. Korman, Sls. Mgr.; C. L. Farrand, Jr., Asst. Sls. Mgr.

FEMCO, INC., Irwin, Pa. 160

Exhibiting: New Products—Remote Control and Indication, Carrier and Audio Communications.

FISCHER & PORTER CO., Hatboro, Pa. 430, 444

Exhibiting: Data Reduction and Automation Systems.

FREED TRANSFORMER CO., INC., Brooklyn 27, N. Y. 133

Exhibiting: New Products—Electronic counters; magnetic amplifiers; portable megohmmeter. **Regular Products**—Transformers, reactors, toroid inductors; filters, magnetic amplifiers; ultrasonic components; and laboratory test equipment.

In attendance: M. Salzberg, Sls. Mgr.; G. T. Dalrymple, Engr. Inst. Div.; F Wolfe, Engr Inst Div; R M O' Dea, Sls. Engr.; L. Freed, Pres.; D. Gurevics, Ch. Engr.; S. Solzberg, Engr.; J. Solzberg, Sec.

GAP INSTRUMENT CORP., Valley Stream, N. Y. 404

Exhibiting: New Products—Step Motors; Step Transmitters; Differentials; Mechanical Integrator; Analog to Digital Converter; Precision Gears.

GAUDREAU, RIMBACH & ASSOCIATES, Pittsburgh 12, Pa. 409

Services: Plant layout; material handling; production controls; cost controls; punched-card systems.

In attendance: A. T. Gaudreau, Partner, N. Y. City; R. W. Mallick, Partner, Pittsburgh, Pa.; Frank Schneider, Midstates Dist. Mgr. Milwaukee, Wis.; Mrs. S. F. O'Gorman, Receptionist.

GENERAL MILLS, INC., MECHANICAL DIV., Minneapolis 13, Minn. 150, 151

Exhibiting: New Products—"Autofab" Short Run Assembly Machine—a flexible semi-automatic bench-mounted machine for mounting electronic components in printed circuits, rapidly and with uniform quality. "Autofab" Soldering Machine—a bench-mounted machine for semi-automatically dip soldering printed circuits with precise control of time and solder level and temperature.

In attendance: Albert B. Driscoll, Dir. of Equip. Sls.; Paul Peterson, Dev. Engr.; Edmund E. Johnson, Adv. Mgr.; Arthur A. Brevaire, Asst. Eastern Regional Sls. Mgr.; John Roegge, Asst. to Dir. of Equip. Sls.

GENERAL PRECISION LAB., INC., Pleasantville, N. Y. 108-111, 325

Exhibiting: New Products—Ruggedized television camera, Model PD-152 to operate under extreme vibration, noise, shock, and environmental conditions. **Regular Products**—Industrial and institutional television systems, cameras, camera control units, camera switchers, monitors, television projection systems, remote control equipment, etc.

In attendance: Dr. Raymond L. Garman, V. P. and Managing Dir.; Blair Foulds, V. P.; Nat Marshall, Sls. Mgr.; S. L. Thomas, N. Y. District Sls. Mgr.; Norman Wicks, Mgr.—Institutional Television;. A. F Brundage, Mgr.—Shows aand Exhibits; E. J. Manzo, Eastern Reg. Mgr.; E. K. Price, H. L. Ryder, J. P. Webster, Sls. Engrs.; J. W. Mullen, Mid-Atlantic Dist. Sls. Mgr.; J. W. Belcher, Mgr.-App. Engr.; A. G. Balletta, F. R. Pike, L. P. Winship, App. Engrs.

GERBER SCIENTIFIC INSTRUMENT CO., Hartford 3, Conn. 337

Exhibiting: New Products—"Equameter" used for determination of Fourier series, power series, least squares from plotted or recorded curves or test points. **Regular Products**—Variable Scale; Graphanalogue; Derivimeter-Data Reduction units.

In attendance: H. Joseph Gerber, Pres.

KLEINSCHMIDT LABORATORIES

joins hands with

SMITH-CORONA INC

. . . to pioneer new developments in Printed Communication and Electronic Data Processing

KLEINSCHMIDT LABORATORIES — the *foremost* name in printed communication — has recently merged with Smith-Corona Inc itself a famous pioneer in the manufacture of superior typewriters.

The products of each of these companies stand unsurpassed for advanced design and fine performance.

Smith-Corona is a national leader in the production of quality typewriters — portable, standard, and electric — as well as highly-efficient adding machines and cash registers. For many years, Kleinschmidt has been a leader in the printed communications industry with a broad line of high-speed, lightweight, telegraphic communications equipment.

These fine products will of course continue to be marketed. But more important, these two already forward-looking companies—Kleinschmidt and Smith-Corona — will pool their resources to make new advances with new products in new fields.

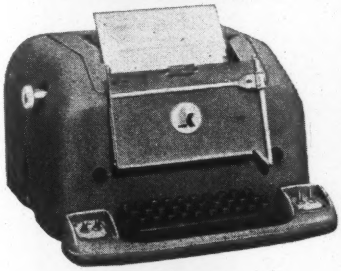
Such advances may be expected in the fields of electronics and integrated data processing — the rapid reproduction and transmission (for one example) of such business information as sales orders, shipping data and other communications.

Together, we face eagerly the opportunities of the future — just as we recollect with pride our contributions of the past.

KLEINSCHMIDT

. . . the foremost name in printed communications

A SUBSIDIARY OF SMITH-CORONA INC



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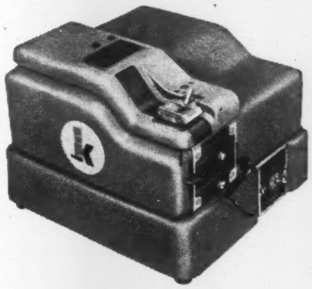
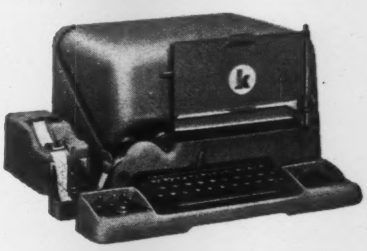


Tape Transmitter

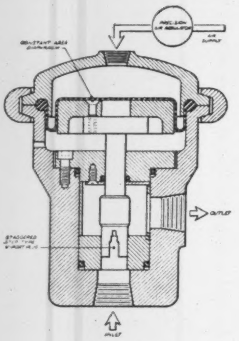


Typing Reperforator and Tape Transmitter

For more information circle **86** on inquiry card.

COMPLETE BACK PRESSURE CONTROL SYSTEM

This sectional drawing shows the design and construction of our novel Micro Delta P Controllers. When used with a regulated air supply, they provide a complete back pressure control system. A Micro Delta P Controller maintains a constant pressure on the discharge side of a non-pulsing hydraulic system by throttling the flow from the hydraulic power source at any flow rates within its range.
A significant feature of the Controller is the constant area, rolling type diaphragm. Use of it results in linearity between the loading pressure and the controlled back pressure. This construction, as opposed to piston type actuator, also provides greater sensitivity and repeatability with minimum hysteresis.

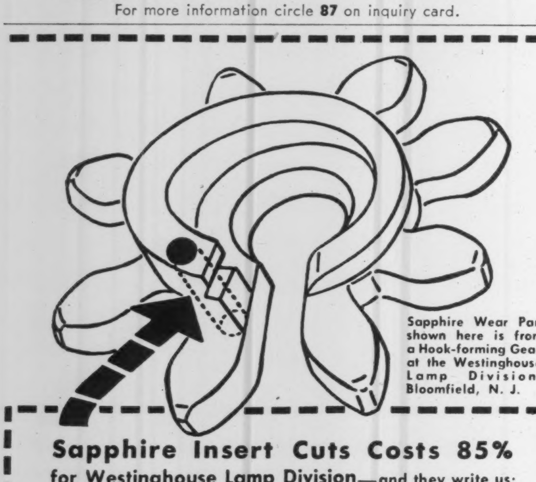


Micro Delta P Controllers have been used for many purposes such as the maintaining of a constant upstream pressure from the discharge of test pumps, and as controllers for hydraulic dynamometers. Two Micro Delta P Controllers used together can provide preset and intricate loading patterns for various types of actuator testing.
Write for our new bulletin, No. 544 which gives complete details and shows suggested schematic flow diagrams.

INDUSTRIAL ENGINEERING CORP.
IEC

INDUSTRIAL ENGINEERING CORPORATION
525 E. Woodbine, Louisville 8, Ky.

For more information circle **87** on inquiry card.



Sapphire Wear Part shown here is from a Hook-forming Gear at the Westinghouse Lamp Division, Bloomfield, N. J.

Sapphire Insert Cuts Costs 85%
for Westinghouse Lamp Division—and they write us:

"The use of the sapphire at the critical wear point has drastically reduced the wear problem, for the Forming Gears with inserts outlast the gears without inserts at an average ratio of 10:1. Using a sapphire insert in the gear has meant an 85% reduction in the yearly cost of this item in addition to reducing expensive machine downtime."

If you have a friction or wear problem that means frequent replacement of close-tolerance, expensive parts such as this, send for an analysis by our engineering staff . no charge, of course. Other typical solutions are illustrated in our brochure . . . send for it today!

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"Precision Sapphire Products Miniature Sub-Assemblies"
Main Office and Factories — 526 Tindall Ave., Trenton, N. J.
Manufacturing Subsidiary — Guayama, Puerto Rico

For more information circle **88** on inquiry card.

EXHIBITORS, PRODUCTS—CONTINUED

GORN ELECTRIC CO., INC., AIRCRAFT CONTROLS CO., DIV., Stamford, Conn. 544

Exhibiting: New Products—GAB1000—vacuum pressure switch (pressures to 2" Hg absolute); GHF5400—horizontal float switch (extends horizontally only 3" into tank at fluid control level); GPP12000—high pressure switch; GPI-2000—Line of miniature, industrial pressure indicators to operate signal lights, relays, or annunciators; GMRD Snap-Joc connectors;—GHRIF & M high temperature connectors. **Regular Products**—Pressure switches; dp switches; air-speed switches; Pin Type electronic and electrical connectors; printed circuit connectors.

In attendance: A. H. Morgan, Mgr. Sls. Engrg.; J. G. Dube, Sls. Dept.; A. Saraceno, Qual. Cont. Mgr.; O. Mueller, Chf. Engr. Aircraft Controls Co. Div.; L. Rumely, Asst. Div. Mgr. Electronics Div.; E. S. Cornell, Chf. Engr. Electronics Div.; M. Gorn, Pres., Gorn Electric Co.

GORRELL & GORRELL, Westwood, N. J. 510

Exhibiting: New Products—Ten-in-One interval timer; multi-cam cycling timer; M-G cycling timers; operations recorder; recycling timer; instrumentation drives; one-way clutch; etc. **Regular Products** Chartmovers; gear trains; charting papers.

In attendance: L. M. Gorrell, Pres.; Joseph Conklin, Plt. Mgr.; J. Gorrell, Dir.; Leo Bolet, Experimental Engr.

W. & L. E. GURLEY CO., Troy, N. Y. 401

Exhibiting: New Products—Precision patterns on glass & metal; shaft digitizer; linear scales; linear and angular coincidence reading systems; circuit controlling anemometers.

HAMMARLUND MFG. CO., INC., New York 1, N. Y. 551

Exhibiting: New Products—Centralized operations control "COC", equipment for telemetering, remote operation and remote supervisory control. **Services**—Systems engineering for utilities, refineries, pipe lines, railroads and heavy industry.

In attendance: F. F. Sylvester, Sls. Mgr.; L. C. Menkes, Asst. Sls. Mgr.; Stan Lescarboura, Adv. Mgr.; R. M. Daugherty, Dir. of Engrg.; A. M. Lerner, Section Chief; F. L. Peters, R. S. Pettigrew, R. E. Barnhill, Dale Cowan, Sls. Engrs.; Sue Montecalvo, N. Y. Off. Sec.

HANSON-GORILL-BRIAN, INC., Glen Cove, L. I., N. Y. 102

Exhibiting: New Products—Modularized Industrial Automatic Data Logging Systems; Thyratron Circuit Components and Systems.

A. W. HAYDON CO., Waterbury 20, Conn. 330

Exhibiting: New Products—Sub-miniature repeat cycle timer for d-c operation—one-third size and one-quarter weight of standard units; sub-miniature time delay relay; precision interval timer. **Regular Products**—D-c timing motors; 400-cycle, reversible 60-cycle timing motors; cycle timers; time delay relays; intervalometers; stop clocks.

In attendance: R. J. Harrant, Sls. Mgr.; R. W. Perkins, F. Hoffman, P. Famiglietti, G. W. Burns, J. A. Niekerk, A. N. Milliken, Sls. Engrs.

HEAT TIMER CORP., New York 12, N. Y. 139

Exhibiting: New Products—Smoke Indicating Alarms; Recorder-Totalizers; Combustion Controls.

HEINEMAN ELECTRIC CO., Jersey City 6, N. J. 132

Exhibiting: Circuit breakers and relays.

KARL HEITZ, INC., New York 17, N. Y. 505

Exhibiting: New Products—ALPA single lens reflex 35mm camera featuring a ground glass **with clearspot** for microscopic photography at high magnification. **Regular Products**—Cameras, refractometers, spectroscopes, microscopes and accessories.

In attendance: Karl Heitz, Pres.; Marc Tobler; Helen R. Westerman.

GERALD K. HELLER COMPANY, Baltimore 23, Md. 411

Exhibiting: New Products—CX25 motor controller—operates ¼ h.p. shunt-wound d-c motor on 115 volts a-c single phase.

In attendance: P. Cushing, Jr., Leo Fitz, Jr., H. W. Ruby, Sls. Reps.; G. K. Heller, Owner.

THE HICKOK ELECTRICAL INSTRUMENT CO., Cleveland 8, Ohio 144

Exhibiting: New Products—Cathode ray oscilloscope, Model 770; mutual conductance tube tester, Model 750. **Regular Products**—Electrical indicating instruments; electronic test equipment.

In attendance: R. D. Hickok, Pres.; H. D. Johnson, V. P.-Sls.; R. K. Arbogast, R. A. Underhill, K. E. Hughes, Fred Bush, Carl Quirk, Walter Boiko, Jack Jartley, C. E. Babcock, Sls. Engrs.

HILLYER INSTRUMENT CO., INC., New York 13, N. Y. 161, 520

Exhibiting: New Products—Automatic locating and drilling machine; Multiple channel programmer; Transacter system.

HOLLIDAY-HATHAWAY CO., INC., New York 22, N. Y. 426

Representing several precision component and equipment manufacturers.

In attendance: Dorothy I. Holliday, Pres.; Kenneth E. Hughes, Gen. Mgr.; Frank J. Stevens, Fred Bush, Eugene Dowd, George McCarthy, Tom McManus, Hal H. Everett, J. Doolittle, Lewis Carlan, Daniel Workman, David S. Launt, Richard Moran, James F. Newlon, Carl Quirk, Walter Boiko, Jack Hartley, Kelsey Martin, Chas. E. Babcock, Sls. Engrs.

Simplest pneumatic controller to use and maintain

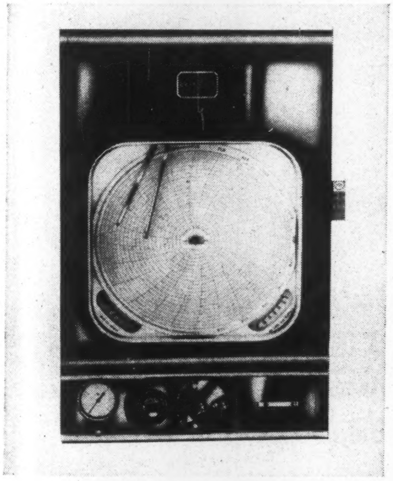
Bristol gives you improved stability of control action —but keeps basic simplicity of Series 500 Controllers

Bristol Series 500 Pneumatic Controllers are the easiest controllers on the market to use and maintain—still the most dependable and trouble-free.

The reason? The basic simplicity of the operating mechanism. *That* hasn't changed in the years since we introduced this long-time favorite among instrument men. Reason No. 2: they are equipped with famous Bristol measuring elements.

Easy calibration

It's this foolproof simplicity of the control system that makes calibration so easy on Series 500 controllers. *Only one* service adjustment is required and provided to exactly calibrate the control system. The control system can be completely disassembled and after reassembly (even with replacement of parts) can be restored to precise calibration with this *one* adjustment.



BRISTOL'S® SERIES 500 CONTROLLER, shown here with four-position transfer station. Internal station also available.

No special tools are required. A ¼-inch wrench is all that's needed.

The 500's completely interchangeable parts, accurately designed and manufactured to extremely close tolerances, make possible this built-in calibration.

And check these features:

Improved control stability—advanced automatic control techniques have been applied by Bristol engineers to improve stability of control action in the new Series 500W Controllers.

Wide-band models offer choice of ½ to 400% proportional band with simple band shift.

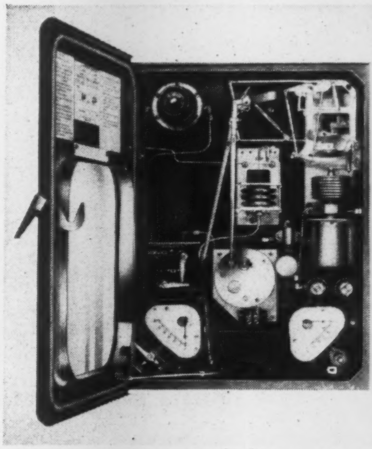
True zero derivative setting—exclusive with Bristol.

Reset action stops in reset models—again a Bristol exclusive—prevent loss of control due to prolonged deviation from set point.

Four-position internal transfer station with automatic, manual, test, and service positions, plus pressure-matching button and manual pressure regulator, for maximum convenience in process control.

Complete data available

Write today for engineering data on Bristol's Series 500 controllers for your critical control problems. They're available for *automatic control of temperature, pressure, vacuum, draft, absolute pressure, liquid level, humidity, pH value, electrical measurements, and mechanical motion.* The Bristol Company, 113 Bristol Road, Waterbury 20, Conn.



FOUR-POSITION INTERNAL TRANSFER STATION shown here in interior view of Series 500 Controller. Permits remote manual control, testing and servicing without disconnecting instrument.

YOU CAN GET THESE CONTROL MODES:

1. Fixed narrow band (on-off)
2. Proportional band—½ to 100% and ½ to 30%.
3. Reset with wide band—rates 0.1 to 10 or 1 to 300 repeats per minute. Proportional band ½ to 400%.
4. Derivative (rate)—½ to 100% proportional band. Derivative time 0.2 to 20 min., plus zero derivative setting.
5. Reset plus derivative—proportional band and reset rate as in "reset" above. Derivative time as in "derivative" above.

YOU CAN HANDLE THESE CONTROL PROBLEMS:

1. Cascaded control 2. Selective control 3. Ratio control 4. Time-program control 5. Pneumatic transmission.

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TRAIL-BLAZERS IN PROCESS AUTOMATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

For more information circle **89** on inquiry card.

EXHIBITORS, PRODUCTS—CONTINUED

HARVEY HUBBELL INC., Bridgeport, Conn. 523

Exhibiting: Wiring devices and interlock connectors.

HYCON MFG. CO., Pasadena 8, Calif. 136

Exhibiting: New Products—Digital Voltmeter with printout system, measures and records in one operation and produces permanent record—for production testing, inspection, research and development. Memory Delay Unit—produces delayed pulses for each received pulse, to operate Hycon aerial camera as part of UCCS. Hyconverter—transistor power supply to replace vibrators, inverters, and dynamotors from 15 watts to 1 kilowatt. **Regular Products**—VTVM; digital rack-mounted oscilloscope; color bar/dot generator; Universal Camera Control System.

In attendance: Ray D. Patton, Industrial Rels. Dir.; Don Downie, Public Rels. Dir.; E. J. Norman, Sls. Mgr. and Eugene DiSciullo, Sls. Rep., Hycon Electronics.

INDUSTRIAL TIMER CORPORATION, Newark 4, N. J. 508, 512

Exhibiting: New Products—Punched-card reading, controlling and timing equipment; multi-cam timer kit. **Regular Products**—Synchronous motor-driven timing devices; Interval, time delay, and single-cycle and repeat cycle multi-cam timers; running time meters; tandem recycling timers.

In attendance: R. A. Rossney, F. G. Corbutt, Bernard Volin, K. P. Kraemer, Div. Sls. Mgrs.; L. L. Neidenberg, Treas., Sls. Mgr.

THE INSTITUTE OF RADIO ENGINEERS, New York 36, N. Y. 105

Exhibiting: Publications of the IRE; membership information.

In attendance: Herbert A. White, N. Y. Dist. Mgr.; William C. Copp, Exbts. & Adv. Mgr.; Miss Lillian Petranek, Reservations Mgr.

INSTRUMENTS PUBLISHING COMPANY, Pittsburgh 12, Pa. 169, 170

Exhibiting: Publications—"Military Automation", "Instruments & Automation" and "Instrument & Apparatus News". Buying Directory—"The Instruments and Automation Handbook & Buyers' Guide" Books—"Process Control", "Nuclear Reactors for Industry and Universities", "The Automatic Factory", "The Computer Handbook."

INTERCONTINENTAL DYNAMICS CORP., Englewood, N. J. 427

Exhibiting: New Products—Sigmatron and Edgetrol—Electronic Test Equipment.

INTERNATIONAL BUSINESS MACHINES CORP., New York, N. Y. 348

Exhibiting: New Products—Time Equipment.

INTERNATIONAL STANDARD TRADING CORP., New York 6, N. Y. 527

Exhibiting: New Products—12 Point High-Speed Stepping Relay 7500/12. Regular Products—G10/241E Nomotron gas-filled decade counter; magnetic pushbuttons; intercommunication telephones; teleprinters and associated tape equipment; automatic, self-supervised pneumaic tube systems.

In attendance: J. T. Benjamin, V. P.; W. Stieber, Proj. Mgr.; F. Warden, Chf. Des. Engr.; E. M. S. McWhirter, Tech. Dir.; D. D. Bulkley, Sls. Engr.; H. J. Browne, A. Imbornoni, D. Morrison, Proj. Engrs.

JERROLD ELECTRONICS CORP., Philadelphia 3, Pa. 407

Exhibiting: New Products—(1) Wide Band Television Transportation System—Two channels of high definition video can be multiplexed on a single coaxial cable by use of FM carriers. 600 line pictures will be transported over this system consisting of FM modulators, demodulators, and wide band preamplifiers. (2) Sweep Generator, Model 900—a continuously variable sweep from 0.2 to 1000 mc center frequency. Sweeps widths, a spectacular 300 mc continuously variable down to 0.1 mc. **Regular Products**—Coaxial Cable fittings; RF testing equipment, Line Amplifiers; Distribution Amplifiers; Isolation Units and Matching Transformers.

In attendance: Robert N. Vendeland, Mgr., Indust. Sls. Div.; G. Worth Warnick, Chf. Fld. Engr., Sls. Div.; Max H. Kraus, Asst. to the Pres.; Don Kirk, V. P. Dir. of Res.; Ken Simons, Sr. Proj. Engr.; Walter Goodman, Mgr., Jerrold N. Y.; John Perry, Sls. Engr., Jerrold, N. Y.

KAYDON ENGINEERING, Muskegon, Mich. 137

KELLOGG SWITCHBOARD & SUPPLY CO., Chicago 3, Ill. 406

Exhibiting: Relays; counting unit.

In attendance: R. H. Williamson, Mgr. Indus. Sls.; J. A. Rudy, Mgr. Relay Sls; J. E. Boeing, J. Kitchen, J. Kaelber, P. Mack.

KLEINSCHMIDT, INC., Deerfield, Ill. 336

Exhibiting: New Products—Teleprinters.

KULKA ELECTRIC MFG. CO., INC., Mt. Vernon. N. Y. 314

Exhibiting: New Products—Miniature and sub-miniature terminal blocks. Development of new molded type of materials.

In attendance: Eugene R. Kulka, Pres.; William Kulka, Treas.; E Edelman, Sls. Mgr.; A. Friedman, B. Smith, George Antonion, Sls. Reps.

KYBERNETES CORP., New York 16, N. Y. 547

Exhibiting: New Products—Automatic data logger; scanning and annunciator equipment.

"PIG-TAILORING"

. . . . a revolutionary new mechanical process for higher production at lower costs. Fastest PREPARATION and ASSEMBLY of Resistors, Capacitors, Diodes and all other axial lead components for TERMINAL BOARDS, PRINTED CIRCUITS and MINIATURIZED ASSEMBLIES.

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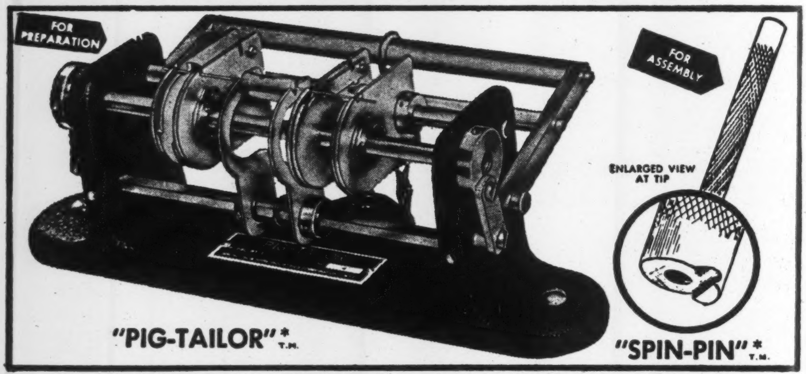

The "PIG-TAILOR" plus "SPIN-PIN" — Accurately Measures, Cuts, Bends, Ejects and Assembles both leads simultaneously to individual lengths and shapes — 3 minute set-up — No accessories — Foot operated — 1 hour training time.

PIG-TAILORING provides:

1. Uniform component position.
2. Uniform marking exposure.
3. Miniaturization spacing control.
4. "S" leads for terminals.
5. "U" leads for printed circuits
6. Individual cut and bend lengths.
7. Better time/rate analysis.
8. Closer cost control.
9. Invaluable labor saving.
10. Immediate cost recovery.

PIG-TAILORING eliminates:

1. Diagonal cutters.
2. Long-nose pliers.
3. Operator judgment.
4. 90% operator training time.
5. Broken components.
6. Broken leads.
7. Short circuits from clippings.
8. 65% chassis handling.
9. Excessive lead tautness.
10. Haphazard assembly methods.

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Write for illustrated, descriptive text on "PIG-TAILORING" to Dept. IA-10P

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DESIGNERS AND MANUFACTURERS OF ELECTRONIC EQUIPMENT
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● A new dual-beam cathode-ray oscillograph with facilities for precise observation, comparison and measurement of two related a-c or d-c signals.

Has two complete vertical amplifiers with response flat to d-c and uniform within 30% to 300 kc. Amplitude measuring on both channels includes 16 ranges from 400 volts full scale to only 4 millivolts for full deflection to scale limits. The most sensitive range permits a-c or d-c measurements in the microvolt region. Balanced input is available on the seven most sensitive ranges.

High-level, accurate, calibrated, linear sweeps; automatic beam gate; sweeps range from 1 sec./inch to 2 usec./inch in 19 steps common to both channels.

X-amplifier provides up to 20 inches of undistorted sweep expansion; external horizontal input to either or both channels.

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INTENSITY
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FOCUS
INTENSITY
BEAM SELECTOR
X SELECTOR
CHANNEL A
SWEEP
X AMPLIFIER
CHANNEL B
Y POSITION
X POSITION
Y POSITION
VOLTS FULL SCALE
SWEEP VERNIER
SYNC AMPLITUDE
X AMPL SELECTOR
VOLTS FULL SCALE
SWEEP RATE

Observe, compare and measure two related AC or DC signals with the new, high precision

PRICE

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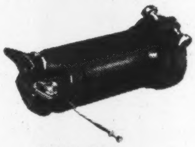
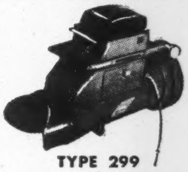
CATHODE-RAY OSCILLOGRAPH

AND FOR THE RECORD...



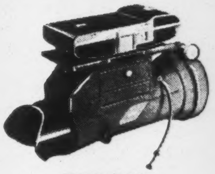
TYPE 296

Versatile, economical 35 mm general-purpose oscillograph record camera with f/2.8 lens. Price $149.50



TYPE 299

General-purpose recording camera accepts variety of backs for 120 size roll film, cut film or film pack; inexpensively converted into print-a-minute Polaroid Land camera. Price $265.00



TYPE 302

For permanent records in just a minute with Polaroid-Land back; by simple, inexpensive change of backs can be adapted for general-purpose recording with other than Polaroid films. Price $285.00

TYPE 321-A

Continuous motion or single-frame recording on 35 mm perforated or unperforated film or recording paper; film speeds variable in steps from 0.8 to 3600 inches/minute. Price $1050.00

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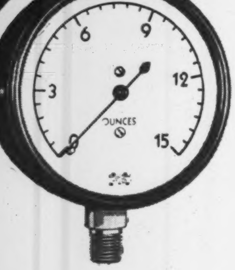
MARSHALLTOWN
DIAPHRAGM GAUGE
For Accurate Pressure Measurement in Ounces or Inches of Water



Marshalltown Figure 83 is an extremely sensitive gauge that uses a carefully seasoned bronze diaphragm to accurately measure very low pressures. It is used extensively on many types of natural gas installations for checking low pressures.

Write for details and price. LOOK TO MARSHALLTOWN FOR ONE OF THE MOST COMPLETE LINES OF INDICATING PRESSURE GAUGES MADE!

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- T/C CELLS FOR 225°C OPERATION
- POWER SUPPLY WITH COMPLETE CIRCUITRY FOR 5 MINUTE HOOK-UP
- PANEL UNITS—High sensitivity and high precision panel instrument for gas purity, trace impurities and mixing.

WRITE, WIRE OR TELEPHONE TODAY FOR COMPLETE INFORMATION AND NEW GOW-MAC DATA SHEETS.

GOW-MAC INSTRUMENT CO.
100 KINGS ROAD, MADISON, N. J.

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EXHIBITORS, PRODUCTS—CONTINUED

L & O RESEARCH AND DEVELOPMENT CORP., Wayne, Pa. **410**

Exhibiting: Automatic Frequency Transmission Measuring System (recording frequency transmission of a network from 30 cycles to 150 kilocycles); Flat-copy continuous Scanning Facsimile Transmitter (for regular wire or radio-voice communication-channel transmission of maps, photos, printed or handwritten text, etc.).

LANDIS & GYR, INC., New York 36, N. Y. **533**

Exhibiting: Impulse and pre-determined impulse counters; miniature ball and roller bearings.

LARSON INSTRUMENT COMPANY, Terrytown, N. Y. **506**

LAROE INSTRUMENT Co., Bethesda 14, Md. **331**

G. G. LEEDS CO., Great Neck, L. I., N. Y. **418**

Exhibiting: Products of Anatran Engrg. Corp., Electronic Measurements Co., Inc., Houston Technical Labs., Non-Linear Systems, Technical Electronics Corp.

LEETRONICS, INC., Brooklyn 1, N. Y. **550**

Exhibiting: **New Products**—Solenoid-operated ratchet mechanism; rotary stepper. **Regular Products**—Ac rotary solenoid.

In attendance: R. A. Draghi, General Mgr.; H. H. Wolff, Ch. Engr; J. D. Zasa, Sls. Mgr.

G. H. LELAND, INC., Dayton 2, Ohio **324**

Exhibiting: **New Products**—Ledex rotary solenoids; circuit selectors; stepping switches; and hermetically sealed units.

LIBRASCOPE, INC., Glendale 1, Calif. **325**

(see Royal McBee Corp.)

MACKENZIE WALTON CO., Pawtucket, R. I. **162**

Exhibiting: Seamless tubing of copper, brass, bronze, nickel silver and other copper-base alloys, in capillary, bourdon spring, thin wall, braid covered and special shape.

In attendance: Norman W. Fulton, V. P. & Gen. Mgr.; J. Louis Schaefer, Asst. to the V. P.; Robert J. Eberts, Jr., Plt. Engr.; Morris Wuerpel, Sls. Mgr.; John J. Condon, David C. Clem, William A. Olson, Sls. Reps.

MAGNETIC ANALYSIS CORPORATION, Long Island City 1, N. Y. 515

Exhibiting: Magnetic analysis equipments; comparator; metal tester.

In attendance: Wm. S. Gould, Jr.; Pres.; J. M. Callan, Ch. Engr.; V. L. Spoley, J. C. DeMaio, Field Engrs.

GORDON L. MATTSON & ASSOCIATES, Chicago 3, Ill. **545**

MICRO SWITCH DIV., Minneapolis-Honeywell Reg. Co., Freeport, Ill. **126, 127**

Exhibiting: **New Products**—3-Light Plug-in Pushbutton Switch—3 separate lamps alternately light the plastic button; snap-action operation; connections to lamps and basic switches pre-wired to female connector. **Regular Products**—Precision snap-action switches and mercury switches. Rotary, toggle and pushbutton manual types. Roller arm, leaf, lever, plunger, rod mechanical types.

In attendance: Gerry Boyle, John Tropsa, Bill Greaser, Ken Davies, Bob Remley, Bill Madelung, John Scott, Al Bahnsen, George McNamara, Fld. Engrs.

MIDWESTERN INSTRUMENTS, Tulsa, Okla. **441**

Exhibiting: **New Products**—Model 560 oscillograph for recording under extreme acceleration and shock conditions. **Regular Products**—Oscillographs; magnetic structures; galvanometers; bridge balance units; hydraulic servovales; torque motors; servoamplifiers; data repeaters.

In attendance: F. B. Cope, Jim Wood, Rex Welch, Sls. Engrs.; K. C. Danney, Steve Wilmot, Fld. Service Engrs.

MINIATURE PRECISION BEARINGS, INC., Keene, N. H. **540**

Exhibiting: **New Products**—Miniature precision ball bearings.

MINNEAPOLIS-HONEYWELL REG. CO., MACHINE CONTROLS DIV., Minneapolis 8, Minn. **124**

Exhibiting: **New Products**—Transistor servo amplifier; Electro-hydraulic servovalves; Electro-hydraulic control systems; Two-axis tracer system for hydraulic or electric drives.

In attendance: John J. Rudolf, Mgr., Machine Controls Div.; Howard L. Harrison, Supv., Machine Controls Div.; Robert L. Fillmore, Sr. Dev. Engr., Machine Controls Div.

MODERNAIR CORP., San Leandro, Calif. **343**

Exhibiting: **New Products**—Heavy Duty Cylinders—Solenoid Valves; Pneumatic cylinders and Control valves in typical circuits as applied to industrial applications. **Regular Products**—Hydraulic cylinders and valves; Pumping Units; Filters, Regulators, Lubricators.

In attendance: John E. Goldring, Pres.; Wm. W. Burke, Joseph P. Strassle, Anthony B. Ulva, Edward Bedell, Arthur J. Whitney, Austin F. Lawther, Sls. Mgrs.

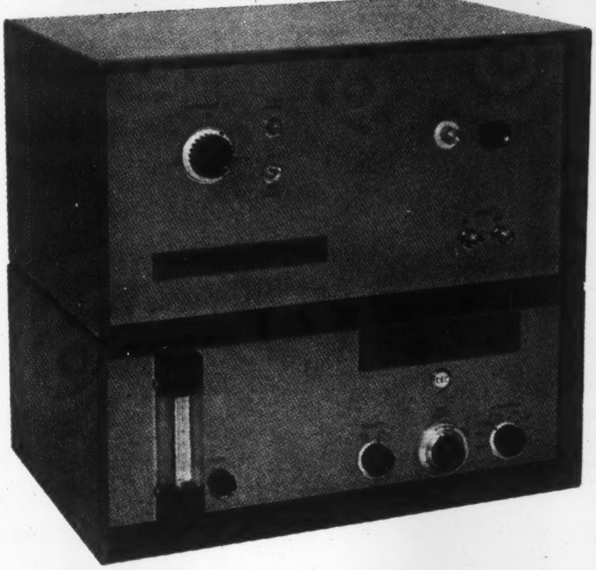
NASH ENGINEERING COMPANY, South Norwalk, Conn. **163, 164**

Exhibiting: Air compressors for automation instrumentation.

announcing . . .

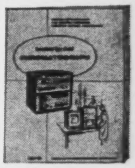
CEC's new
Type 26-201

GAS
CHROMATOGRAPH



Already hailed as the greatest analytical development in the past 10 or 20 years, gas chromatography gains new flexibility, wider range, and greater precision with CEC's new Type 26-201 Gas Chromatograph. Modular design makes it possible to buy the exact type and size system you need, then expand it with minimum additional investment as your analytical needs change. Several analyzer units may be operated from a single control unit, and since each analyzer's temperature may be independently set, change-over time is cut to a minimum, and over-all system speed remains high.

There is a place for the 26-201 Gas Chromatograph in practically every laboratory faced with a heavy load of quantitative gaseous and liquid mixture analysis. Both as a replacement for older instruments (e.g., intermittent stream analyzers) and as a supplement to mass spectrometers and infrared instruments, this new instrument can mean an important saving in dollars and man-hours. Write today for a complete description and specifications . . . Bulletin CEC 1831-X1.



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MODULAR DESIGN . . . expandable as analytical needs change; columns easily interchanged; quick change-over between analyzer units and central control unit.

WIDE TEMPERATURE RANGE . . . temperature of the analyzer continuously adjustable from 60°C to as high as 250°C, and regulated to within 0.5°C.

HIGH REPRODUCIBILITY . . . internal sample valve. heated to the temperature of the analyzer, controls size of gas samples within ±0.5%.

VARIABLE TEMPERATURE CONTROL . . . regulation within ±0.5°C over continuous range of 60°C to 250°C.

SMALL SAMPLES . . . microsamples make instrument valuable in research applications.

VERSATILE . . . operates with either absorption or partition columns to handle wide variety of compounds.

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ELECTRONIC INSTRUMENTS FOR MEASUREMENT AND CONTROL

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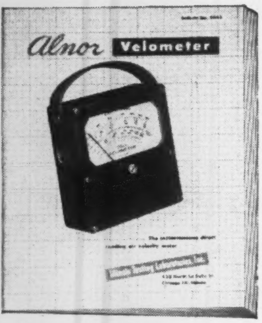
ALNOR VELOMETER



Developed to facilitate quick and easy determination of air velocities, the Alnor Velometer is a compact, precision instrument that provides instantaneous, direct readings in feet per minute, without timing, calculations or reference to conversion tables. Guaranteed accurate, in ranges from 20 f.p.m. to as high as 24,000 f.p.m. Also available with metric or miles-per-hour calibrations.

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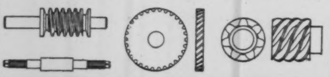

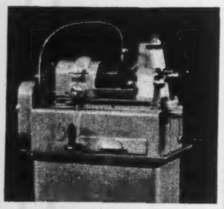

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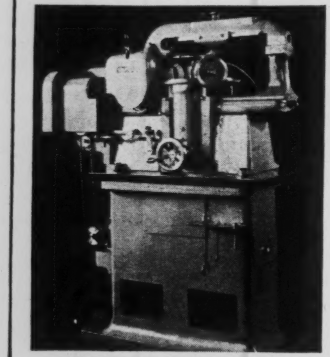

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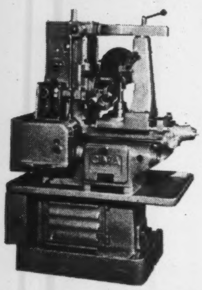

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EXHIBITORS, PRODUCTS—CONTINUED

NATIONAL CASH REGISTER CO., Dayton 9, Ohio **147, 148, 149**

Exhibiting: New Products—Model 38-M accounting machine with new approach to combined multiplying and bookkeeping. **Regular Products**—Class 31 accounting machine with full-amount keyboard and built-in electric typewriter.

NORTH AMERICAN AVIATION, INC., ROCKETDYNE DIV., Los Angeles 45, Calif. **412**

Exhibiting: New Products—Aircraft guidance equipment; Airborne Digital Computers.

NORTH AMERICAN VAN LINES, INC., Fort Wayne 1, Ind. **445**

Services: Movers of high value products (such as electronic devices and instruments of very fragile nature, etc.), exhibit displays, new uncrated furniture, world wide service via land-sea-air.
In attendance: Harold S. Bechert, George H. Smith, J. J. McElwain.

PAK-RAPID, INC., West Conshohocken, Pa. **129**

Exhibiting: New Products—Packaging machine equipped with feeding mechanism, automatic printing unit, and attachment which automatically removes air from package and inspects each package for leakers.
In attendance: James Irvine, Pres.; Benjamin Karpowicz, V. P.; Samuel B. Vrooman, Sec.; John J. Coakley, Tech.; E. M. Porter, George Rawak, Sls. Reps.

PANELLIT, INC., Skokie, Ill. **529, 530**

Exhibiting: New Products—Automatic Process Information Systems; Centralized Process Control Systems; Industrial Annunciators.

PAR-METAL PRODUCTS CORP., Long Island City 3, N. Y. **344**

Exhibiting: New Products—Universal Cabinet Racks with fixed or detachable side panels for standard 19" and 24" wide panels and complete accessories such as vertical side supports, mounting angles, chassis, phono changers, etc. **Regular Products**—Utility Desk Assemblies—in single, double, or triple arrangements; cabinet racks; chassis; panels.
In attendance: A. A. Parmet; John Novak; I. Wertentheil; J. Blatt.

PIC DESIGN DIV., BENRUS WATCH CO., E. Rockaway, L. I., N. Y. **554**

Exhibiting: New products such as 120 pitch gears, gear blanks, special bore gears. **Regular Products**—Precision instrument components.
In attendance: Winfred M. Berg, Pres.; P. Wallenberger, Sls. Mgr.; R. Schwemker, V. P.; R. S. Christie, S. Christie, H. Notes, J. Kendall, A. Calhone, T. Swartz, Sls.

GEORGE A. PHILBRICK RESEARCHES, INC., Boston 10, Mass. 142

Exhibiting: New Products—Octal Plug-in Computing Amplifiers; Passive Plug-in Computing Networks; Precision Regulated Power Supplies.
In attendance: John M. Embree, Dir. Sls. and Appl. Eng'ng.—Philbrick Researches; Robert Crane, Mgr.—Kee Enterprises; Bill Brown, Mgr.—Technical Instruments, Inc.; Jack Riley, Bart Healey, Donald Jenkins, Eugene Haas, Haig Tatosian, Eng'ng. Representatives—Technical Instruments, Inc.

P-K INDUSTRIES, INC., North Arlington, N. J. **526**

Exhibiting: Paul Venturi Ball Control Valves.

POST MACHINERY CO., ELECTRONIC PRODUCTS DIV., Beverly, Mass. **501**

Exhibiting: New Products—Multi-channel Input Control (counts to 12 lines simultaneously using one electronic counter); Edge-Register Detector; magnetic switch for high and low speed rpm counting.
In attendance: Walter P. Fergani, Pres.; Harold L. Carlman, Sls. Mgr.; Joseph L. Forni, Adv. Mgr.; Lawrence A. Tibbetts, Asst. Sls. Mgr.; James W. Farmer, Ch. Electronic Engr.; William Longval, Dev. Engr.; Albert K. Scriven, Ch. Engr.

POTTER & BRUMFIELD MFG. CO., INC., Princeton, Ind. **152**

Exhibiting: New Products—Electric Relays.

PRODUCTION INSTRUMENT COMPANY, Chicago 6, Ill. **303**

Exhibiting: Electric counters; dozens counters; automatic batch counters, stroke and revolution counters; other counting devices.

POTTER INSTRUMENT CO., Great Neck, L. I., N. Y. **549**

Exhibiting: Digital Magnetic Tape Handler; Perforated Tape Reader; Magnistors; Frequency Time Counter; data handling equipment.

THE PYLE-NATIONAL COMPANY, Chicago 51, Ill. **123**

Exhibiting: New Products—"W" Series submersible all-weather heavy-duty connectors, plugs, receptacles. **Regular Products**—Electrical connectors, plugs, receptacles; circuit control pylets; signal lights; Pylet conduit fittings.
In attendance: W. Raymond, Mgr. Sls., J. Shearer, Asst. Mgr. Sls., Connector Div.; G. J. Loewe, Dist. Mgr.; H. F. Whalen, Asst. Dist. Mgr.; R. B. Saunders, L. J. Milewicz, Sls. Reps.

REEVES INSTRUMENT CORP., New York 28, N. Y. **333**

Exhibiting: New Products—REACR electronic analog computers, automatic control equipment; servo-mechanical parts; resolvers; gyros.

REEVES SOUNDCRAFT CORP., New York 22, N. Y. **341**

Exhibiting: New Products—Type A instrumentation tape for data

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The Automatic Factory by Stephen A. June, et al, 1955, cloth, 88 pages. Price $1.50 ☐

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Hoover Electronics	627
International Business Machines Corp.	611, 605
Kollsman Instrument Corp.	649
Lockheed Aircraft Co., Atlanta, Ga.	626
Glenn L. Martin, Baltimore, Md.	646
Minneapolis-Honeywell Regulator Co.	603, 604
North American Aviation, Inc., Columbus Div.	601
North American Aviation, Downey, Calif.	620, 622
Pillsbury Mills, Inc.	631
Remington Rand Univac	652
Sperry Gyroscope Company	651
Stavid Engineering	606
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REINHOLD PUBLISHING CORP., New York 22, N. Y. 342

Exhibiting: "Automatic Control magazine."

REMINGTON RAND DIV., SPERRY RAND CORP., New York 10, N. Y. 534, 537

Exhibiting: Offices and engineering computer equipment.

REVCO, INC., Minneapolis 5, Minn. 146

Exhibiting: New Products—Motorized Zero-Max variable speed reducers; infinitely variable "Geneva-Motion" units; Zero-Max with screw control. **Regular Products**—variable speed Zero-Max; variable gearhead units; TORK-O-STAT overload relays.
In attendance: Richard G. Gray, Pres.; Richard G. Hersey, Sls. Engr.; Leo S. Cross, Alex Benzemann, Arch Mason, Alex Gabriels, Frank Tracy, Earl Whitaker, William Cross, Harold Fox, Clair Williamson, Sls. Reps.

ROYAL MCBEE CORP., Port Chester, N. Y. 325

Exhibiting: Librascope computer equipment, including LGP-30 digital computer.

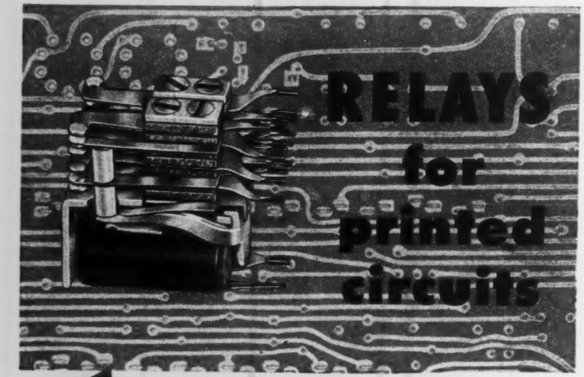
SANDERS ASSOCIATES, INC., Nashua, N. H. 338

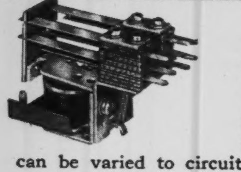
Exhibitors: New Products—Flexible Printed Circuitry & Cables—cables and harnesses in flat form, single or multi-layer construction, using printed circuits on flexible KelF; Electro-hydraulic Servo Valves, including Model SA-19 for extremely low temperature with low (200-1000 psi) pressure operation. **Regular Products**—Minicube blowers; phase comparators, Tri-Plate microwave attenuators, accelerometers, mylar capacitors.
In attendance: William B. Wilkens, Sls. Mgr.; Kenneth S. Knapton, Jr., Application Engr.; Louis A. Garten, James A. Lynch, Representatives.

SENSITIVE RESEARCH INSTRUMENT CO., Mt. Vernon, N. Y. 521

THE SERVO SYSTEMS CO., Newark 12, N. J. 414

Exhibiting: New Products—Servo-Kit a low-cost basic laboratory tool consisting of a vacuum tube amplifier, two Barber-Colman servo motors and the Rider training course, "Basic Synchros and Servomechanisms"; instrument servo amplifiers; indicator servo assembly "Model 6B-1"; automatic positioning control "Model AS". **Regular Products**—Commercial electrical and electronic servo system components.
In attendance: Fred B. MacLaren, Joel P. Wallenstein, Engrs.; Julian F. Reichman, Walter B. Reichman, Salesmen.





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SERVOMECHANISMS, INC., Westbury, N. Y. 525

Exhibiting: Instrument motors and accessory equipment including, hysteresis synchronous motors, control motors, Damped Control Motors, axial flow blowers, power supplies, etc.
In attendance: Thomas R. Cataldo, Sls. Mgr.; Franklin A. Watson, John A. McMahon, William McCutcheon, Nicholas A. Christian, Sls. Engrs.; Ronald J. Gray, Adv. Co-ord.

SHEPARD LABORATORIES, INC., Summit, N. J. 538

Exhibiting: New Products—Electronic Film Splicer to weld without cement "Cronar", Mylar, Acetate or Nitrate based 35mm, Cinemascope, 16mm film; flip-flop tube checker. **Regular Products**—Electronic high speed "Typer" producing "hard copy" from output of electronic computer, card reader, or magnetic tape. Servo transport digital tape reader.
In attendance: Francis H. Shepard, Jr., Pres.; Richard D. Schotter, Chf. Engr.; Walter Hladky, Electronic Engr.; John Slohoda, Electronic Production Engr.; L. Earl Crouse, Sec.; Leroy Coe, Proj. Engr.

SOROBAN ENGINEERING, INC., Melbourne, Fla. 403

Exhibiting: New Products—Paper Tape Data Preparation Devices and Data Output Tabulating Equipments.

STANDARD ELECTRONICS RESEARCH CORP., New York 21, N. Y. 442

Exhibiting: New Products—Maser-new molecular oscillator utilizing ammonia to obtain a frequency of 23,870,131,12 . . . KC/sec with a stability of 1 part in 10^{10}. Makes possible the construction of frequency standards of hitherto untold stability. **Regular Products**—Diamacontrol, Diamatrol, Integrator, X-ray Gages.
In attendance: Dr. Frederic Fua, Res. Dir.; M. N. Kirby, Sls. Mgr.; Howard Jackson, Engr.

ALVIN M. STOCK, INC., Union City, N. J. 347

Exhibiting: Indicating, non-indicating and recording temperature controls for hazardous locations; refrigeration, heating, and cooling, controls; process timers; temperature limit controls; combustion safeguards and igniters; electric valves for gas, air, steam and oil.
In attendance: Alvin M. Stock, Pres.; Arthur J. Kelley, V. P.; Norbert E. Bertl, V. P.; Albert M. Whitman, Harry Garrison, Walter Fodor, Sls. Engrs.; William S. Pope, Office Mgr.

STROMBERG-CARLSON CO., A DIV. OF GENERAL DYNAMICS, Rochester 3, N. Y. 158

Exhibiting: New Products—XY Data Switching System—to switch electronically, information on Teleprinter circuits. EUCLID Solid State Computer—Electronic printed wiring units for use in data processing. 24-Button Key Switches—features 24 switches on one mounting. "BB" Relay—Gang type relay accommodating 100 "make" combinations or equivalent. Deca Switch—Stepping switch that will step over 11 steps on 4 levels.

SUPERIOR ELECTRIC CO., Bristol, Conn. 119, 120

Exhibiting: New Products—"Stabiline" automatic voltage regulators Type TM (Tubeless Magnetic). **Regular Products**—"Powerstat" variable transformers; "Stabiline" automatic voltage regulators; "Varicell" d-c power supplies; "Voltbox" a-c power supplies; "Superior" 5-way binding posts.
In attendance: B. G. Deming, District Mgr.; J. S. Louden, Sls. Mgr.; C. Downey, J. Bradley, P. James, Sls. Engrs.

SURPRENANT MFG. CO., Clinton, Mass. 350

Exhibiting: Regular Products—Engineered wire and cable for the electronic and aircraft industries.
In attendance: G. J. Mulloney, Richard Surprenant, George Gannon, Frank Wynn, Jack Wright, Sls. Engrs.; D. C. Alexander, Ch. Engr.

TECH LABORATORIES, INC., Palisades Park, N. J. 420

Exhibiting: New Products—High quality long-life stepping switches for automation, remote control, and telemetering. **Regular Products**—Attenuators, potentiometers, switches.
In attendance: Magnus Bjorndal, Pres.; Gerrit J. Van Barren, Sls. Mgr.; Erling Bjorndal, Customer Service; Joseph L. Duffy, Asst. Sls. Mgr.

TELAUTOGRAPH CORP., Los Angeles 19, Calif. 143

Exhibiting: New Products—Telescribers Systems; "Electronic Longhand."

TELEREGISTER CORP., Stamford, Conn. 436

Exhibiting: New Products—Electronic Data Processing and Transmission equipment.

THOMAS FLEXIBLE COUPLING CO., Warren, Pa. 145

Exhibiting: Miniature flexible couplings for use on servos, computers, etc.

TOLEDO SCALE CO., Toledo 1, Ohio 317

Exhibiting: New Products—Industrial Weighing Equipment.

TRANSITRON, INC., Manchester, N. H. 438

Exhibiting: New Products—Transitron SG-132 Precision VHF-UHF sweep signal generator operating between 10 and 480 megacycles per second. **Regular Products**—Precision VHF signal generators; spectrum analyzer; laboratory accessories.
In attendance: S. K. Lackoff, Pres.; R. H. Baer, V. P. for Engrg; A. Axelrod, Chf. Electronics Engr.

TRINCOR CORPORATION Representing Hankison Corporation, Trinity Equipment Corp., Industrol Corporation, Uniflow Valve Corporation 165

Exhibiting: New Products—Industrol Corp.—Purging Systems (completely automatic compressor-dehydrator units for the pressurizing and purging of transmission lines. Uniflow Valve Corp.—Control valves. **Regular Products**—Hankison Corp.—Condensifilters, Dehydrafilters;

Industrol Corp.—Midget Dryers; Trinity Equipment Corp.—Thermowells; multipoint thermocouple assemblies.

UNDERWOOD CORPORATION, New York 16, N. Y. 429

Exhibiting: New Products—Electric Servotyper.

UNIVERSAL GENERAL CORP., NEW York 13, N. Y. 121

Exhibiting: **New Products**—"Super-Modern" automatic dial telephone system. **Regular Products**—Relays; solenoids; Sensitrols; stepping switches; shock mounts.

In attendance: Morris Greenberg, Pres.; Robert G. Herzog, V. P.; Frances Pollock, Asst. Secy.; H. B. Smith, Mgr. Telephone Div.; Joseph DeJusto, Chg. of Special Tests, etc.; Phillip M. Ryan, Consultant on Computers.

VEEDER-ROOT, INC., Hartford 2, Conn. 323

Exhibiting: A-c and d-c electrically operated counting devices.

WARNER & SWASEY RESEARCH CORP., New York 1, N. Y. 443

Exhibiting: **New Products**—"Probomat Automatic Control Units" for precision positioning of machine tools, with tape, card and Pre-Set programming. The Probomat Controls are applicable to jig borers, milling and boring machines, rotary and rectangular positioning tables. **Regular Products**—"Probograph automatic recording precision measuring machines; "Probomat" tape or card programmed automatic precision measuring machines.

In attendance: W. S. Tandler, Pres.; Charles R. Eltinge, Sls. Mgr.; George Schaffer, Asst. to Pres.; Arthur Sloan, Appl. Eng.

WECKESSER COMPANY, Chicago 30, Ill. 128

Exhibiting: **New Products**—Threaded nylon rod; molded nylon screws; nylon washers. **Regular Products**—Nylon and plastic cable clamps, metal re-enforcing washers for same; perforated nylon strapping; molded nylon screws and nuts; stampings.

In attendance: Harry A. Ewalt, Gen. Mgr.

WOLLENSAK OPTICAL CO., Rochester 21, N. Y. 518

Exhibiting: **New Products**—Fastax Division's line of high-speed photographic instrumentation equipment.

ZENITH ELECTRIC CO., Chicago 10, Ill. 103

Exhibiting: **New Products**—Automatic control equipment; timers; switches.

ZOOMAR, INC., Glen Cove, N. Y. 320

Exhibiting: **New Products**—Remote controlled and manual controlled Zoomar lenses demonstrated live on television cameras of different makes.

In attendance: Walter Steuer, V. P.-Sls. Mgr.; Herbert Lowen, Ch. Mathematician; Alfred J. Quittner, Ch. Engr.

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AMERICAN SUGAR REFINING CO., IND. RELATIONS DIV., New York 5, N. Y.	602
EMERSON RADIO & TV., Jersey City, N. J.	628
GENERAL ELECTRIC CO., INDUSTRIAL COMPUTER SECTION, Syracuse, N. Y.	629
GENERAL ELECTRIC CO., SMALL AIRCRAFT ENGINE DIV. West Lynn, Mass.	647
HOOVER ELECTRONICS	627
INTERNATIONAL BUSINESS MACHINES CORP., New York, N. Y.	611, 605
KOLLSMAN INSTRUMENT CORP., Long Island, N. Y.	649
LOCKHEED AIRCRAFT CO., Atlanta, Ga.	626
GLENN L. MARTIN, Baltimore, Md.	646
MINNEAPOLIS-HONEYWELL REGULATOR CO., Minneapolis, Minn.	603, 604
NORTH AMERICAN AVIATION, INC., COLUMBUS DIV., Downey, Calif.	601
NORTH AMERICAN AVIATION, Downey, Calif.	620, 622
PILLSBURY MILLS, INC., Minneapolis 2, Minn.	631
REMINGTON RAND UNIVAC, New York, N. Y.	652
SPERRY GYROSCOPE CO., Great Neck, L. I., N. Y.	651
STAVID ENGINEERING	606
TELEREGISTER, Stamford, Conn.	648
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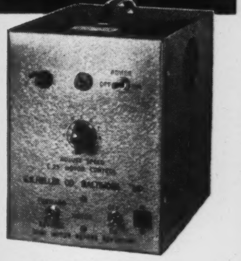

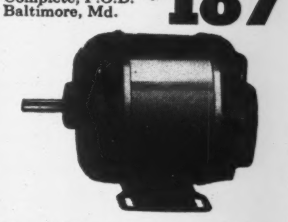

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CONTENTS OF THIS DEPARTMENT

Aircraft Instruments 2066
Amplifiers 2087
Computing and Data Processing 2057
Count 2056
Data Processing 2057
Dimensional Gaging 2072
Displacement 2055
Electrical and Electronic Instruments 2078
Electrical Components 2038
Electrical-instrument Accessories 2080
Electrical Testing 2074
Electromechanical Components 2091
Electronic Components 2090
Electronic Instruments 2078
Fittings 2096
Flow Rate 2053
Force, Load, Weight 2055
Industrial Television 2103
Laboratory Equipment 2061
Liquid Level 2052
Load 2055
Mechanical Components 2095
Mechanical Testing 2072
Miscellaneous 2101
Missiles Instruments 2066
Nucleonics 2066
Photography 2064
Power Supplies 2082
Pressure and Vacuum 2053
Process Measurement and Control 2046
Rectifiers 2088
Shop Equipment and Supplies 2068
Speed 2056
Temperature 2049
Time, Speed, Count 2056
Tubing 2096
Vacuum 2053
Valves 2098
Weight 2055

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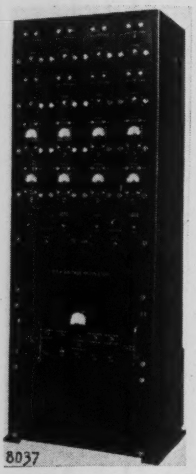
PROCESS INSTRUMENTATION



New "packaged" protective and measuring system for oil and gas pipelines and chemical industry comprise individual plug-in electronic units for temperature, pressure, and vibration-alarm and shut-down functions; pressure measurement; and telemetering. Primary elements: resistance bulbs, pressure and vibration pickups, etc. Systems are explosion-proof and fail-safe.—*The Indikon Co., 76 Coolidge Hill Rd., Watertown 72, Mass.*

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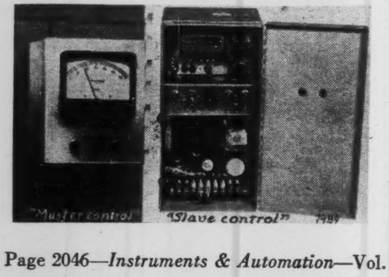
SUPERVISORY AND REMOTE POSITIONING CONTROL SYSTEM

New variable remote control system enables both positioning and proportioning plus monitoring of remote equipment over one circuit. By moving a panel key a supervisor can, for instance, actuate a remote operator in "increase" or "decrease" direction and simultaneously observe resultant change in affected flow, pressure, etc. System features modular construction; can be installed by average plant electrician. As requirements grow, modules can be added. Visible and audible alarm, as well as fail-safe lockout and hold-out features, can be added.—*The Sparks-Withington Co., Sparton Control Systems Div., Jackson, Mich.*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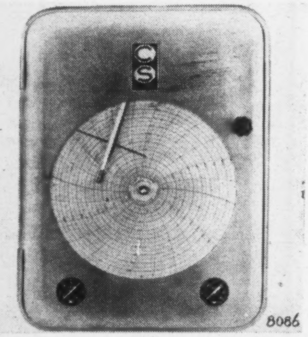
PRESSURE AND TEMPERATURE INSTRUMENTATION

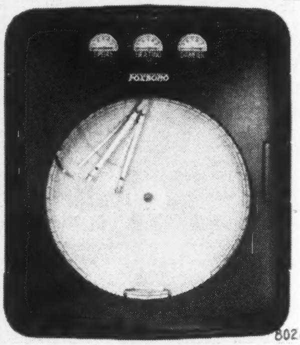
New pressure and temperature recording controllers and recorders are added to maker's line. "Type 57" pneumatic recording controller (illustrated) controls and records both pressure and temperature. Available models have 9" or 12" spring- or electric-driven charts; on-off or 1-100% proportional action. Pressure ranges 0-5 to 0-5000 psi (0-25,000 psi for 12" single pen only); temperature range −350°F to 1200°F. "Type 58" recorder records pressure and temperature, in same ranges as "Type 57." 6", 9", or 12" charts, spring- or electric-driven; one to four pens. Accuracy 1%.—*A. W. Cash Co., P. O. Box 551, Decatur, Ill.*



For more information circle **303** on inquiry card.

DRY KILN CONTROLLERS

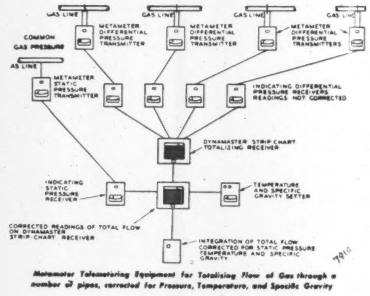
New series of instruments, designed specifically for lumber drying operations, supersedes circular case models; embodies latest developments in controller design; includes both Single-Zone and Multi-Zone Temperature-Humidity Recorder-Controllers. On-off wet and dry bulb control standard; narrow band proportional control optional (particularly useful in reducing damper "whipping").—*Foxboro Co., Foxboro, Mass.*


FOXBORO
8028

For more information circle **304** on inquiry card.

COMPENSATED-TOTALIZING TELEMETERING SYSTEM

New system of telemetering transmitters and receivers and electronic self-balancing instruments totalizes several flow measurements, corrects for temperature, pressure, specific gravity and supercompressibility to provide a corrected flow value. Instruments can be supplied also in various types to perform averaging, totalizing, multiplying, and dividing computations involving basic measured variables listed above; also to extract square root, square, or otherwise compensate mathematically.—*—The Bristol Company, Waterbury 20, Conn.*

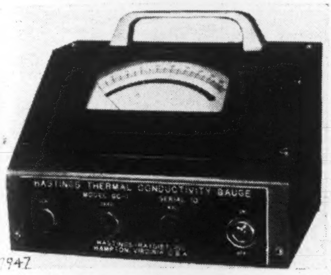

GAS LINE
GAS LINE
GAS LINE
GAS LINE
COMMON GAS PRESSURE
AS LINE
METAMETER DIFFERENTIAL PRESSURE TRANSMITTER
METAMETER DIFFERENTIAL PRESSURE TRANSMITTER
METAMETER DIFFERENTIAL PRESSURE TRANSMITTERS
METAMETER STATIC PRESSURE TRANSMITTER
INDICATING DIFFERENTIAL PRESSURE RECEIVERS READINGS NOT CORRECTED
DYNAMASTER STRIP CHART TOTALIZING RECEIVER
INDICATING STATIC PRESSURE RECEIVER
TEMPERATURE AND SPECIFIC GRAVITY SETTER
CORRECTED READINGS OF TOTAL FLOW ON DYNAMASTER STRIP-CHART RECEIVER
INTEGRATION OF TOTAL FLOW CORRECTED FOR STATIC PRESSURE TEMPERATURE AND SPECIFIC GRAVITY
7910

Metameter Telemetering Equipment for Totalizing Flow of Gas through a number of pipes, corrected for Pressure, Temperature, and Specific Gravity

For more information circle **305** on inquiry card.

THERMAL CONDUCTIVITY GAGE

New type of gas thermal conductivity measuring instrument utilizes maker's compensated thermopile



principle said to end "instability and temperature effects of the older resistance type instruments." New cell incorporates six noble-metal thermocouples, arranged to compensate for temperature changes in gas sample and also for rate of change of temperature effects.—*Hastings-Raydist, Inc., Hampton, Va.*

For more information circle **306** on inquiry card.

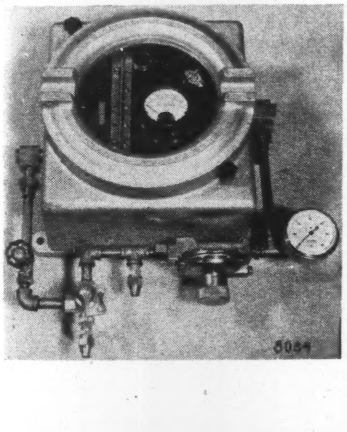
ELECTRICAL CONDUCTIVITY CELL

New corrosion-proof variable-immersion conductivity cell features a type 301 stainless steel body, Teflon cell parts, graphite electrodes, and an extremely high cell constant; is for use in moderately strong HNO_3 containing chlorides.—*Industrial Instruments, Inc., Cedar Grove, N. J.*

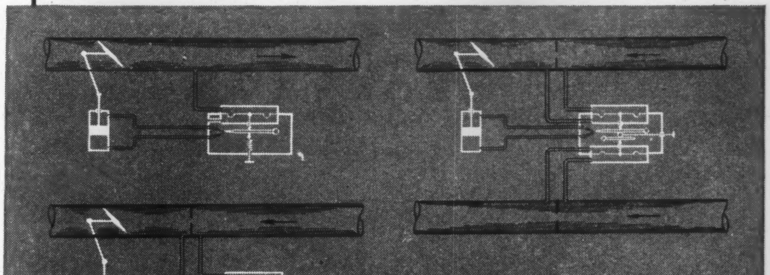
For more information circle **307** on inquiry card.

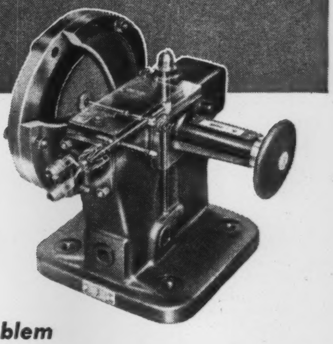
THERMAL CONDUCTIVITY-TYPE SELECTIVE ANALYZER

New "Thermatron" permits measuring concentration of one gas in mixtures of gases more specifically than heretofore, and without sample-condi-



THE "Jet-Pipe" AGE IS HERE...
FOR PRESSURE, FLOW, COMBUSTION OR RATIO CONTROL





and so is the
ASKANIA
Jet-Pipe Regulator

...the simplest accurate long-life solution to any regulator problem

- Check your most desirable specifications for the IDEAL regulator to control pressure—flow—combustion—proportion—other variables.

Do they include

1 Rugged Construction **2** Dependability **3** Long Life **4** Accuracy **5** Speed **6** Inexpensive Maintenance **7** Unimpeded Operation in Freezing Weather **8** Freedom for use ANYWHERE?

All these features are common to all ASKANIA Jet-Pipe Regulators.

From Minute Signal to POWERFUL FORCE

The real magic behind the Jet-Pipe Regulator is the power which can be initiated by a minute signal—the degree to which the signal can be amplified—and the speed and accuracy with which it can be transmitted. The conversion of kinetic energy (velocity pressure) into potential energy (static pressure) is an important factor which multiplies the dependability you can expect in every ASKANIA control. The heart of ASKANIA Regulators—the Jet-Pipe—is practically frictionless. Bearings are continuously immersed in oil. Condensation and freezing are impossible. In every way, ASKANIA Regulators are designed and built for continuous, trouble free service over the years.

Applicable to these Controlled Variables:

PRESSURE (Gage, Absolute & Differential) • DRAFT • COMBUSTION • FLOW LEVEL • DEPTH • RATIO • SPEED • DENSITY • CONSISTENCY • EDGE POSITION AND OTHERS

What is your problem? For further information on the type of regulator control which best fits your operation, send today for Bulletin No. 139 and 155. Write the ASKANIA REGULATOR COMPANY, *268 East Ontario St., Chicago, Illinois.*

ASKANIA REGULATOR COMPANY
"CONTROLS FOR INDUSTRY"
HYDRAULIC, ELECTRONIC CONTROLS & SERVOS, GENERAL SYSTEMS, ENGINEERING & COMPUTER SERVICE, VALVE ACTUATORS & CYLINDERS
A Subsidiary of General Precision Equipment Corporation

For more information circle **102** on inquiry card.

CORROSION

WITH

RHODIUM

PLATING

—and be sure it's a BAKER SOLUTION!

Yes . . . the problem of better electrical contact performance is easily solved . . . with Rhodium-plated contacts. Rhodium protects permanently against corrosion . . . provides hard, oxide-free contact surface . . . low, stable contact resistance . . . permits higher pressures, provides low noise level in moving contacts . . . and it wears longer! For uniformly ideal results . . . make sure it's BAKER Rhodium Plating Solution.

Write for free booklet on Rhodium Plating and its advantages.

DATA AND DIRECTIONS FOR ELECTROPLATING WITH RHODIUM

BAKER & COMPANY, INC PRECIOUS METALS

113 ASTOR STREET, NEWARK 5, N. J.
NEW YORK • CHICAGO
SAN FRANCISCO • LOS ANGELES

ENGELHARD INDUSTRIES

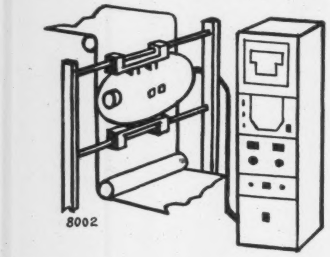
For more information circle **103** on inquiry card.

tioning procedures. Measurements are based on thermal-conductivity principle but also take advantage of convective heat loss. This is done by using four detector cells instead of usual two: Two additional cells are large-diameter, to promote convective heat loss. Filaments of four cells are arranged to maximize effects of the gas to be measured.—*Mine Safety Appliances Co., Pittsburgh 8, Penna.*

For more information circle **308** on inquiry card.

COATING-THICKNESS GAGE AND STREAM ANALYZER

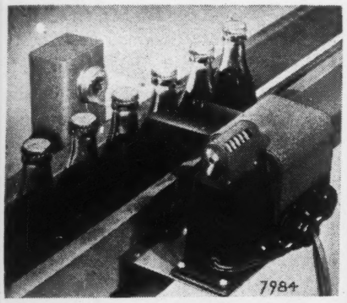
New x-ray fluorescence instrument permits continuous determination of metal-coating thickness to microinch precision; serves also for continuous analytical control in industries where a single element determination is of importance. Three primary components: (1) x-ray head comprising x-ray tube and two detector heads, (2) high-voltage source and (3) ratio recorder comprising an L&N strip-chart recorder, ratio amplifier, and high-voltage Geiger supply. Ratio recorder reads direct ratios of current signals from the Geigers of the two detector heads, one measuring for the element to be determined, and the other a standard reference signal.—*Applied Research Lab., P. O. Box 1710, Glendale 5, Calif.*



For more information circle **309** on inquiry card.

PHOTOELECTRIC CONTROL SYSTEM

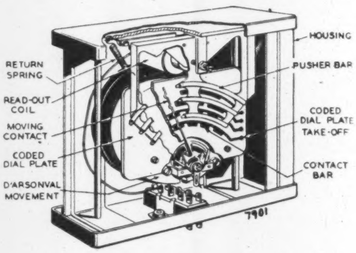
New "PE-150" is inexpensive control that "can be set up by anyone . . . simply plug in like a lamp." Properly placed controls can separate objects according to height. Reflected light can be used to identify light and dark objects. Contacts control 10 amp at 110 vac.—*Ripley Company Inc., Middletown, Conn.*



For more information circle **310** on inquiry card.

POINTER-DEFLECTION CODER

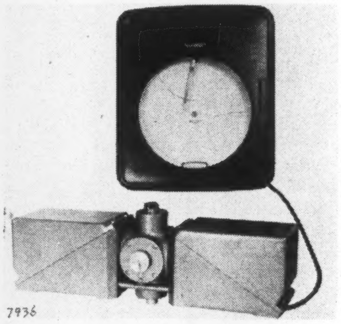
New "LIAD Multi-contact Meter Relay" has a conventional permanent-magnet moving-coil movement but, instead of a dial, one to six segmented bands whereby pointer deflection is converted into binary information.—*Assembly Products Inc., Chesterland 3, Ohio.*



For more information circle **311** on inquiry card.

TURBIDITY RECORDER

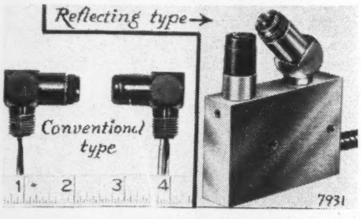
New "Turbidity Detector-Recorder" makes it possible for the first time to measure beer turbidity continuously without laboratory analysis; can be equipped with an alarm to signal presence of beer haze.—*The Foxboro Company, Foxboro, Mass.*



For more information circle **312** on inquiry card.

MINIATURE PHOTOELECTRIC CONTROL SYSTEMS

New "Miniaturized Electric Eyes" can operate relays when a light beam is cut by a passing object, or arranged to operate on light reflected from a surface. Relay box has adjustments whereby relay can be set to operate at any desired threshold. Reflecting type can be targeted to operate on a fine line or color difference. Both lead sulfide and cadmium sulfide photocells are available; also circuits involving delays, monitoring, etc.—*Ess Instrument Co., Bergenfield, N. J.*

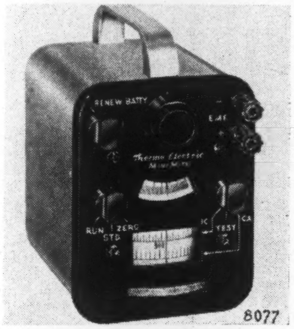


For more information circle **313** on inquiry card.

TEMPERATURE

PORTABLE POTENTIOMETER

New "MiniMite" weighs under 4 lb and measures about 4" x 5" x 6", yet has a scale 23½" long. Standard double-scale range 0-1800°F for iron-Constantan and 0-2400°F for Chromel-Alumel. (Others available.) Accuracy 0.25% of scale range. Can be used to check millivoltmeters and potentiometers.—*Thermo Electric Co., Inc., Saddle Brook, N. J.*



8077

For more information circle **314** on inquiry card.

PORTABLE PYROMETER

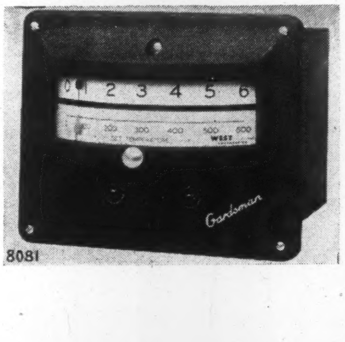
New "Pyrotest 9B" for checking and calibrating all types of plant and lab temperature instruments is said to be "the only instrument of its kind with interchangeable direct-reading scales, and the only single temperature testing unit for use with as many as six types of thermocouples."—*Technique Associates, Inc., 211 E. South St., Indianapolis 25, Ind.*

8074

For more information circle **315** on inquiry card.

TEMPERATURE CONTROLLERS

New 3-position pyrometer-type controllers are easily wired for a wide variety of specialized control applica-



8081

GET 3 DIGITAL INSTRUMENTS IN 1
and eliminate readout error

THE HYCON RACK MOUNTED AC-DC VOLT-OHMMETER

MODEL 615R
Digits are ½" high . . .

Decimal point and polarity sign are illuminated.

Readings are repeatable within 1 digit with no parallax or interpolation errors.

Time-proven electromechanical system

Ideal for a broad range of applications, including production-line testing, field service testing, high-precision research and development work, incoming parts inspection and quality control.

The Hycon 615R applies extremely low current through unknown resistance (2.7 ma. max. on XI range . . . 0.00027 ma. max. on X1000 range). Only 5¼" high, the unit fits any standard 19" relay rack.

PLUS THESE OTHER IMPORTANT FEATURES

- **Complete overload protection**
- **Automatic "off-scale" indication**
- **Jack to permit reading retention**
- **Special designed counter, life-tested for years of use**
- **Available in same unit size with complete print-out facilities for permanent records**

For further information, write for Bulletin IA-10

SPECIFICATIONS

RANGES—DC: 0-1, 10, 100, 1000 volts
AC: 0-10, 100, 1000 volts
Resistance: 0-1k, 10k, 100k, 1 meg, 10 meg
DC INPUT RESISTANCE—11 megohms
AC FREQUENCY RESPONSE—Direct Probe: 30 cps—3 mc
Crystal Probe: 50 kc—250 mc
INDICATOR—3-digit counter with illuminated decimals and polarity sign
ACCURACY—DC and Resistance: 1% full-scale (0.1% optional)
AC: 2% full-scale
POWER REQUIREMENTS—115 volts, 60 cycles, 50 watts
DIMENSIONS—Standard 19" rack panel 5¼" high; chassis 14" deep
FINISH—Navy Gray 15090-111-2 Panel (or customer preference)

Hycon
ELECTRONICS, INC.

1030 South Arroyo Parkway
P. O. Bin "D"
Pasadena, California

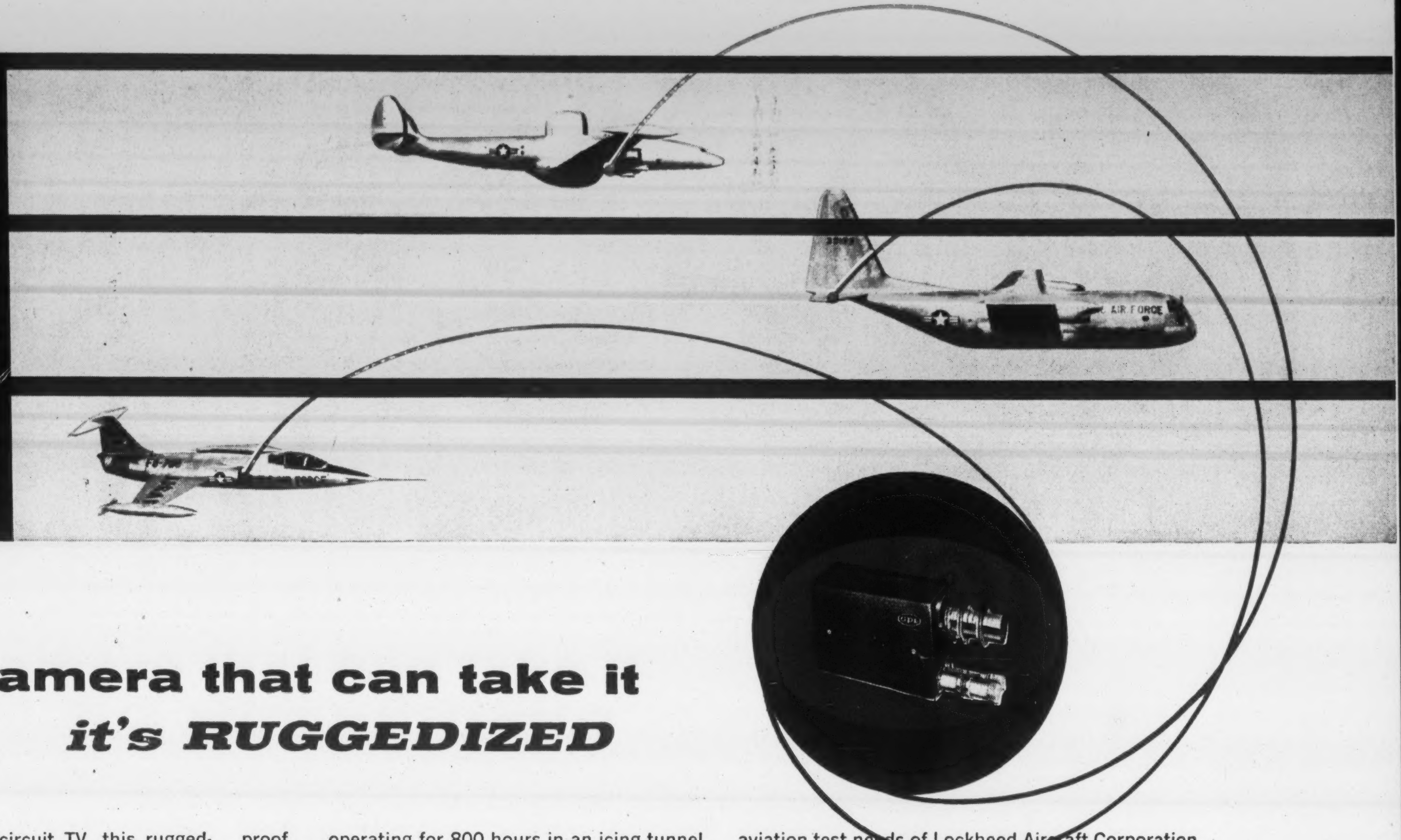
A subsidiary of
HYCON MFG. COMPANY

For more information circle **104** on inquiry card.

ON ENGINE FIRE WALL
GPL Ruggedized TV Camera, mounted to wheel wall housing without shock insulation, monitors landing gear perfectly during take-off, flight, landing.

BENEATH TAIL STABILIZER
Mounted camera enables pilot to observe waver of air flow tufts on horizontal stabilizers as plane approaches stall.

IN JET PLENUM CHAMBER
Camera, dolly-mounted and wheeled through curved air ducts into otherwise inaccessible chamber, checks for presence of foreign objects.



the TV camera that can take it
it's RUGGEDIZED

Unique in closed-circuit TV, this ruggedized, remote-control camera manufactured by GPL packs into six pounds the super-rugged construction that enables it to operate efficiently in extreme environments. It is the only camera to have performed successfully under flight conditions with forces exceeding 15 G's in each of its three axes. Noise levels as high as 175 decibels and altitudes over 70,000 feet do not affect picture detail. Camera can withstand temperatures of minus 55°C to plus 60°C, humidity levels of 100%, and extremely high wind velocities. Though not hermetically sealed, it is sprayproof . . . operating for 800 hours in an icing tunnel, the camera showed no sign of damage or operating failure.

Including motors for remote control of iris and focus, the camera is only 7" long without the lens, $5\frac{3}{8}$" high, $3\frac{1}{8}$" thick—small enough to fit in almost anywhere. It operates on a 525-line system, 60 fields interlaced, 550-line resolution. No external shock mount is required. All controls can be handled from a remote location. Power requirements are minimum.

This new TV camera results from special aviation test needs of Lockheed Aircraft Corporation. Because of its standing in the TV field, General Precision Laboratory was chosen by Lockheed to produce the small-size, remote-focus camera it had developed. In it, ruggedized components are combined in a unique design that isolates critical vidicon tube and video circuit areas from external vibration. GPL has production-engineered it for widest application in heavy construction, engineering research, automotive testing and many other industrial and military operations, as well as in aviation. Write for further information.

ENGINEERS—working at GPL
can put you at the forefront of your profession.
Send your resume to Personnel Manager.

GPL GPL **General Precision Laboratory Incorporated**
Pleasantville, New York

For more information circle 105 on inquiry card.

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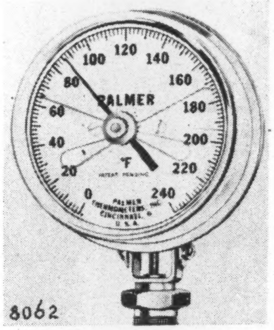
tions. Two types of neutral band, each with two types of control: One, with a single setting pointer, permits no more than 1% of scale range as neutral; the other, with two settings, permits spread up to 20% of range. On-off or proportioning type control available; also automatic reset. All models are free from vacuum tubes.—*West Instrument Corp., 525 N. Noble St., Chicago, Ill.*

For more information circle **316** on inquiry card.

MAX AND MIN POINTERS FOR DIAL THERMOMETERS

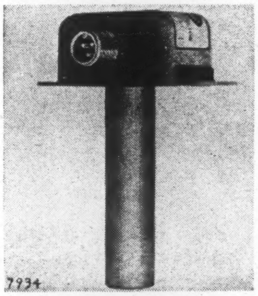
New feature for maker's 3½" and 4½" dial thermometers: red pointer showing maximum and green pointer showing minimum readings; easy to read and to reset.—*Palmer Thermometers, Inc., Cincinnati 12, Ohio.*



For more information circle **317** on inquiry card.

COOLING-EFFECT DETECTOR

New "Series 18801 Thermoswitch," designed to detect inadequate cooling of air-cooled electronic components, senses combined cooling effect of both ambient temperature and air flow-rate. Since it has its own source of heat, it can be set to simulate conditions in the equipment it protects. It can actuate an alarm or command a cooling device.—*Fenwal Incorporated, Ashland, Mass.*



For more information circle **318** on inquiry card.

MINIATURE BAYONET TCs

New miniature bayonet thermocouples include a wide variety of immersion lengths, adapters, lead wires and terminals; feature rapid response; have spring-loaded hot junc-

CONTROL MOTOR
TYPE R 110
SER. NO. H
KEARFOTT COMPANY INC.
LITTLE FALLS, N.J.
SERVO AMPLIFIER

NEW KEARFOTT COMPONENTS

FOR LIGHT, MORE RELIABLE SERVO SYSTEMS

SERVO MOTORS

Standard Kearfott servo motors and servo motor-generator combinations are now available for operation with transistorized amplifiers. These units feature center tapped control phase windings rated 40 volts in series and 20 volts in parallel. Fixed phase excitation to size 10 units is 26 volts 400 cps and to size 11, 15 and 18 motors 115 volts 400 cps.

SUMMARY OF CHARACTERISTICS

Size	Stall Torque	No Load Speed	Watts Phase	Weight
10	.28 oz. in.	6500 RPM	3.1	1.5 oz.
11	.63 oz. in.	6700 RPM	3.5	4.5 oz.
15	1.53 oz. in.	5300 PRM	6	7.30 oz.
18	2.4 oz. in.	5300 RPM	9	12.2 oz.

AMPLIFIERS

A new transistorized servo amplifier suitable for driving size 10 and 11 servo motors is also available. This amplifier provides a 40 volt, 3 watt output. Designed to meet the requirements of MIL-E-5400 it is rated for operation over the ambient temperature range of —54°C to +71°C. A servo type base and a cable with an SM11-20H connector is provided. Dimensions 1 42/64" dia. x 3 25/32" high, weight 8 ozs.

Write Today For Descriptive Technical Data

KEARFOTT COMPONENTS INCLUDE:

Gyros, Servo Motors, Synchros, Servo and Magnetic Amplifiers, Tachometer Generators, Hermetic Rotary Seals, Aircraft Navigational Systems, and other high accuracy mechanical, electrical and electronic components.

Kearfott

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KEARFOTT COMPANY, INC., LITTLE FALLS, N. J.

Sales and Engineering Offices: 1378 Main Avenue, Clifton, N. J.
Midwest Office: 188 W. Randolph Street, Chicago, Ill. South Central Office: 6115 Denton Drive, Dallas, Texas
West Coast Office: 253 N. Vinedo Avenue, Pasadena, Calif.

For more information circle 106 on inquiry card.

You Can't Beat a
BRYANT
MAGNETIC
DRUM

for digital computers, inventory control systems and tape-to-card converters, also as delay lines, synchronizers and frequency generators.

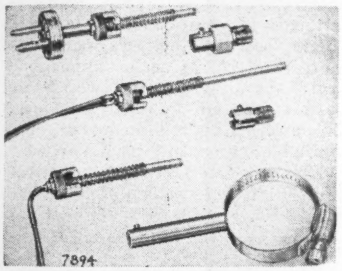
- Designed to purchaser's requirements
- Guaranteed accuracy of drum runout .00010" T.I.R. or less
- Air bearings or super-precision ball bearings
- Belt drive or integral motor drive, speeds to 100,000 RPM
- Capacities to 5,000,000 or more binary digits
- Vertical or horizontal housing
- Head mounting surfaces to suit
- High density magnetic oxide or electroplated magnetic alloy coating

High Speed Motors, Spindles and Drums

Bryant designs and manufactures electromechanical components for precision operation up to 200,000 RPM, and magnetic drums from 2" diameter x 3" length to 20" diameter x 42" length. If you have a problem in applying high speed rotating equipment to your product, write Bryant today.

BRYANT GAGE and SPINDLE DIVISION
P. O. Box 620-I, Springfield, Vermont, U.S.A.
DIVISION OF BRYANT CHUCKING GRINDER CO.

For more information circle **107** on inquiry card.

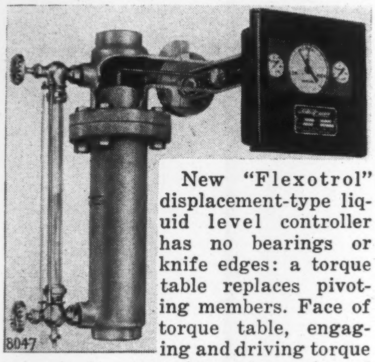


tions. Available: copper-Constantan, iron-Constantan and Chromel-Alumel, three temperature ranges between —300°F and 1400°F.—*Thermo Electric Co., Inc., Saddle Brook, N. J.*

For more information circle **319** on inquiry card.

LIQUID LEVEL

LEVEL CONTROLLER



New "Flexotrol" displacement-type liquid level controller has no bearings or knife edges: a torque table replaces pivoting members. Face of torque table, engaging and driving torque tube, is free to twist under action of displacer. Thus, normal process residues do not hamper operation. Available with external displacer chambers or in models for direct displacer immersion in process vessel. Option: direct mechanical liquid level indication. Proportional (1-150%) or two-position action; automatic reset extra. —*Kieley & Mueller, Inc., 64 Genung St., Middletown, N. Y.*

For more information circle **320** on inquiry card.

LIQUID-LEVEL GAGES

New "Red Flasher Truscale" remote-reading liquid level gages have unique new safety features in which

JERGUSON
7955

scale face lights up and flashes red continuously to warn when liquid level is too high or too low. Accuracy is 0.5%. They can be equipped with signal horns, lights and up to six repeaters.—*Jerguson Gage & Valve Co., 80 Fellsway, Somerville 45, Mass.*

For more information circle **321** on inquiry card.

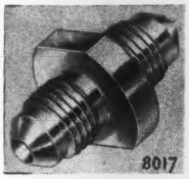
FLOW-RATE

ELECTROMAGNETIC FLOWMETER

New "Nucor Magnaflow" converts liquid velocity into an electric potential without inherent pressure drop; has instantaneous and full-linear response said to make it "ideal for control applications." Dynamic range is limited only by hydraulic system and limits of operating pressures. Instrument can measure flow-rates between 100 cc/min and 2000 gpm. Measurement signal is usually independent of electrical conductivity of liquid; and accuracy of measurement is determined solely by proper design of input circuits of electronic amplifier. Measuring element is a smooth-bore Teflon tube with platinum electrodes.—*Nuclear Corp. of America, Inc., Empire State Bldg., New York 1, N. Y.*

For more information circle **322** on inquiry card.

GAS FLOW RESTRICTORS

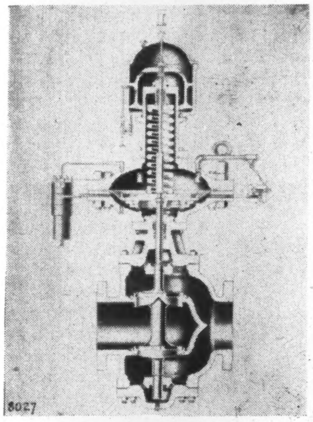

8017

New restrictors, said to represent "a new first in the pneumatic field," restrict gas flow to a predetermined flow rate. By fusing Monel, stainless, and other type metal powders "into a molecular structure," into a fitting similar to an AN fitting, a sintered orifice is obtained, adaptable to all present pneumatic systems where small-hole orifices are now used. Calibrated flow accuracy of 5% is obtainable in production quantities as well as research requirements.—*Del Mfg. Co., 1005 S. Central Ave., Los Angeles 21, Calif*

For more information circle **323** on inquiry card.

PRESSURE and VACUUM

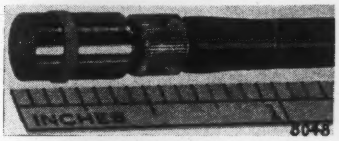
HIGH-PRESSURE REGULATORS


8027

New "Series 883 and 885" are said to solve problem of vertical instability or "jumping" sometimes encountered on high-pressure gas transmission lines. Oil dash-pot damps out any tendency of valve to jump, yet will not cause deviation from control point. Reduced pressure range 100 to 450 psi. Sizes 2" to 12".—*Fisher Governor Co., Marshalltown, Iowa.*

For more information circle **324** on inquiry card.

MINIATURE PRESSURE PICKUPS

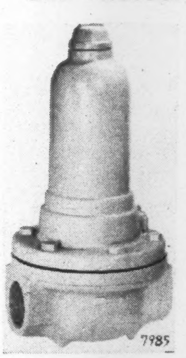


8048

New "High-precision SLM Pressure Transducers," ¼"D×½"L, feature fast response time (about one microsecond). Signals are free from electrical and mechanical noise. New pickups will also measure steady and slowly varying pressures as well as fast pressure transients; are calibrated by static methods. Four models cover ranges from 0.01 to 100,000 psi.—*Kistler Instrument Co., 15 Webster St., N. Tonawanda, N. Y.*

For more information circle **325** on inquiry card.

GAS PRESSURE REGULATOR


7985

New "141" regulator will withstand momentary overloads as high as 1000 psi on the outlet side; provides extra safety for rural gas services. Versatility: four interchangeable orifices and five interchangeable springs for pressures from 3 psi to 400 psi. Absolute lock-up at zero flow.—*Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.*

For more information circle **326** on inquiry card.

VACUUM GAGE

New "PHG-27" single-station discharge-type vacuum gage measures total pressure of condensable vapors

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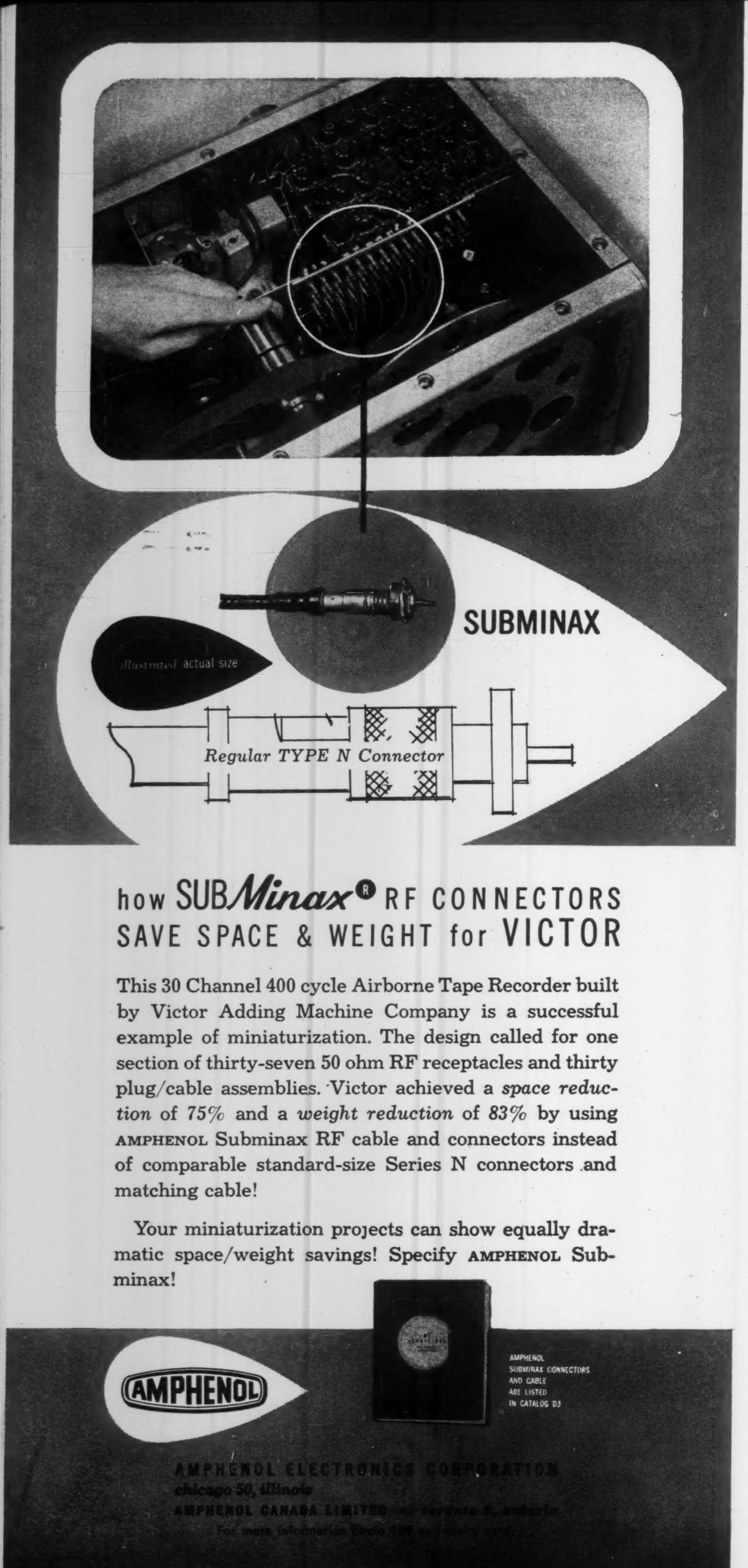
For more information circle **108** on inquiry card.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illustrated actual size

Regular TYPE N Connector

how SUB*Minax*® RF CONNECTORS SAVE SPACE & WEIGHT for VICTOR

This 30 Channel 400 cycle Airborne Tape Recorder built by Victor Adding Machine Company is a successful example of miniaturization. The design called for one section of thirty-seven 50 ohm RF receptacles and thirty plug/cable assemblies. Victor achieved a *space reduction* of 75% and a *weight reduction* of 83% by using AMPHENOL Subminax RF cable and connectors instead of comparable standard-size Series N connectors and matching cable!

Your miniaturization projects can show equally dramatic space/weight savings! Specify AMPHENOL Subminax!

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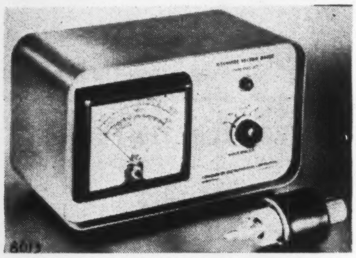
For more information circle [illegible] on inquiry card.



and permanent gases on three scales: 25 microns to 10^{-4} mm Hg; 10^{-4} to 10^{-5} mm Hg; and 10^{-5} to 10^{-7} mm Hg. New sensing tube does less self-pumping at its highest pressure range than did previous models, thus gives truer pressure readings.—*Consolidated Electrodynamics Corp., 1775 Mt. Read Blvd., Rochester 3, N. Y.*

For more information circle **327** on inquiry card.

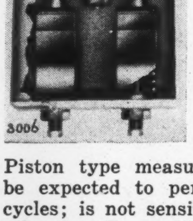
WATER PRESSURE GAGE

WATER PRESSURE TEST
7862

New water pressure test gage is said to be indispensable for every plumber, steamfitter, home engineer, appliance salesmen and air-conditioner engineer; has a 2-1/2" dial with non-breakable crystal; fits any standard water faucet, Range 1 to 200 psi (300- and 400-psi gages can be supplied).—*Marshalltown Mfg. Co., Marshalltown, Iowa.*

For more information circle **328** on inquiry card.

HIGH-LOW PRESSURE SWITCH

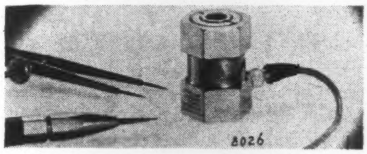


New "9622 or C9622" measures two different pressures in one system and commands independent electric circuits at any two desired points; is useful where system pressure must not exceed or fall below predetermined values. Adjustable range of 15 to 3000 psi (proof pressures from 3000 to 7000 psi). Piston type measuring element can be expected to perform millions of cycles; is not sensitive to jarring or vibration. Two calibrated dials enable user to set either switch. Setting screws can be locked.—*Barksdale Valves, Pressure Switch Div., 5125 Alcoa Ave., Los Angeles 58, Calif.*

For more information circle **329** on inquiry card.

FORCE, LOAD, WEIGHT, DISPLACEMENT

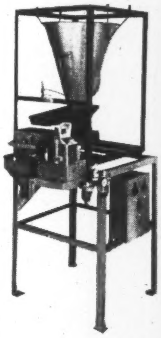
DYNAMIC FORCE GAGES



New "Models 2103 and 2104" are said to make possible new methods of dynamic testing; provide voltage output proportional to dynamic force: self-generated outputs of about 5 v full-scale; ranges 100, 500, 1000, and 5000 lbs; unloaded natural frequencies 20 kc to 50 kc; flat frequency response to at least 5 kc. Physical design permits making gage part of support structure or coupling linkage. Electroceramic element (a new development) assures linearity at temperatures from −65°F to 230°F.—*Endevco Corp.*, 161 *East California St., Pasadena, Calif.*

For more information circle **330** on inquiry card.

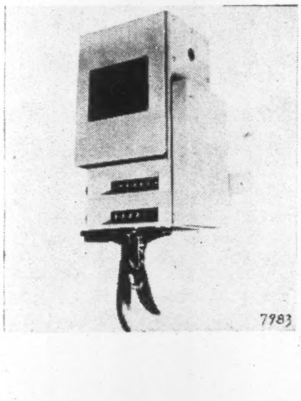
AUTOMATIC NET WEIGHER



New "Model 620 NW-FM 21-30" automatic net weighing machine, for batching or packaging, incorporates maker's even-balance 1-to-1 ratio precision industrial scale with visual indicator; smooth operating net weigh hopper and automatic cutoff controls with efficient material handling equipment. Over-under indicator for visual checking obviates need for separate checkweighing operation.—*Exact Weight Scale Co.*, 944 *W. 5th Ave., Columbus, Ohio.*

For more information circle **331** on inquiry card.

COUNTER FOR WEIGHERS



New remote electric counter with positive clutch drive can record up to 200 weighings per minute; permits user to tabulate and record a weighing process from any point in his plant; can be used to keep production records, as well as tabulate customers' orders.—*Richardson Scale Co., Van Houten Ave., Clifton, N. J.*

For more information circle **332** on inquiry card.

WELDABLE STRAIN GAGE

ONE INCH
8057

New high-temperature strain gage has a dynamic test range to 1600°F; can be spot-welded and test-ready on flat or curved surfaces in less than five minutes. Spot welding installation seldom causes and significant alteration of structure being tested. Available units have a nominal resistance of 120 ohms and a gage factor of 1.80.—*Micro-Test, Inc.*, 657 *North Spaulding Ave, Los Angeles* 36, *Calif.*

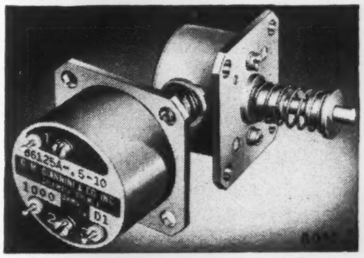
For more information circle **333** on inquiry card.

TORQUEMETER

New pressurized model of maker's "Torquometer" enables measurement of torque in rotating systems in explosive atmospheres; is available in torque ranges to 12,000 pound-inches and speeds to 15,000 rpm. Like standard line, it comprises both electrical means for measuring a torsional strain and a mechanical assembly for providing that strain.—*B & F Instruments, Inc.*, 4732 *N. Broad St., Philadelphia* 41, *Pa.*

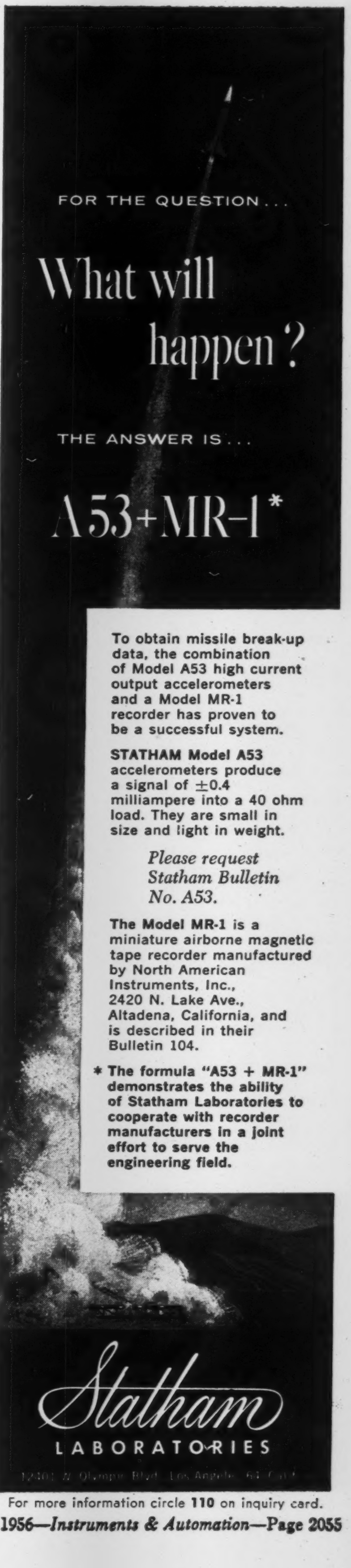
For more information circle **334** on inquiry card.

DISPLACEMENT PICKUP



New "86125A Pancake Rectipot" is a miniature spring-loaded short-stroke linear-motion precision voltage-dividing-resistor-type transmitter featuring less than 1″ body length for a full ½″ stroke of its stainless steel shaft. Standard stroke ranges 0.1″ to 0.5″ in resistance ranges of 1000 and 2000 ohms with 1% linearity and 0.0012″ resolution.—*G. M. Giannini & Co., Inc., Pasadena, Calif.*

For more information circle **335** on inquiry card.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To obtain missile break-up data, the combination of Model A53 high current output accelerometers and a Model MR-1 recorder has proven to be a successful system.

STATHAM Model A53 accelerometers produce a signal of ±0.4 milliampere into a 40 ohm load. They are small in size and light in weight.

Please request Statham Bulletin No. A53.

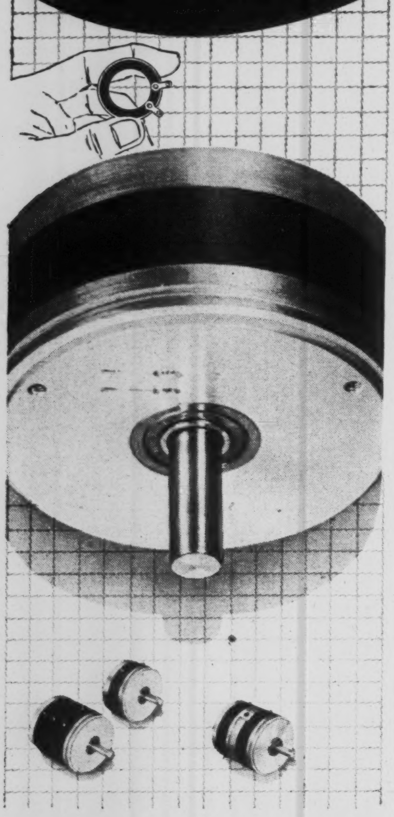
The Model MR-1 is a miniature airborne magnetic tape recorder manufactured by North American Instruments, Inc., 2420 N. Lake Ave., Altadena, California, and is described in their Bulletin 104.

*** The formula "A53 + MR-1" demonstrates the ability of Statham Laboratories to cooperate with recorder manufacturers in a joint effort to serve the engineering field.**

Statham
LABORATORIES
12401 W. Olympic Blvd., Los Angeles 64, Calif.

For more information circle **110** on inquiry card.

CRITICAL POT SPECS* are met at CIC



Equipment designers who demand more than "shelf item" specifications, rely on CIC for dependable delivery of ultra-precise potentiometers.

The result of CIC research, carbon film potentiometers are setting new standards of accuracy, life at higher speeds and performance reliability.

CIC has assisted many firms in a wide variety of industrial instrumentation, military fire control and flight guidance equipment.

Why not discuss your specific requirements with us?

*New carbon film techniques assure virtually infinite resolution; linearity to .01%, sine-cosine to .025%; compact ganging; precision ball bearing servo construction.

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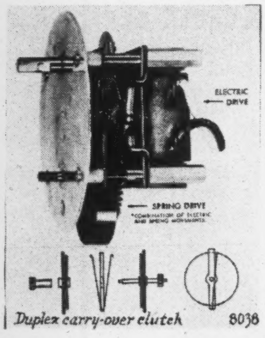
For more information circle **111** on inquiry card.

TIME, SPEED, COUNT

TWO-DRIVE TIMER

New "Duplex Time Component," claimed to be "the perfect timer" for chart driving, process timing, etc.,



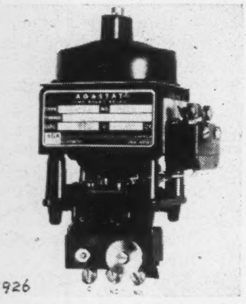
Duplex carry-over clutch 8038

keeps running when power fails or circuits short out; comprises a synchronous electric time unit and a spring-driven time unit which is held in reserve and goes into action instantly. Upon power resumption or circuit repairs, synchronous motor again takes over instantly.—*Industrial Timer Instruments Co.,* 189 *W. Madison St., Chicago 2, Ill.*

For more information circle **336** on inquiry card.

TIME DELAY RELAY

New "Model NETL Agastat" time delay relay allows electrical interlock



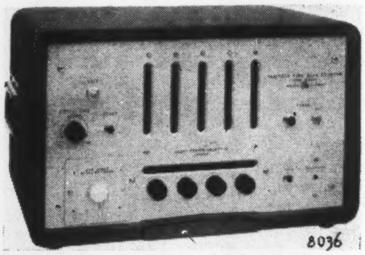
7926

and two step timing; is a combination unit with two normally closed Micro switches and a basic Agastat relay. Units are available for ac or dc in sp-dt double-break, and dp-dt single-break; rated 15 amp at 115 vac.—*Elastic Stop Nut Corp. of America, A'G'A Div., Elizabeth, N. J.*

For more information circle **337** on inquiry card.

FREQUENCY COUNTER

New "DY-2500 Electronic Computing Counter," for measuring flow-rate, etc., in desired units without



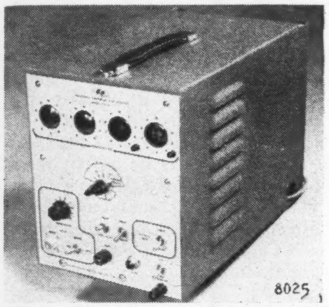
8036

time-consuming conversions, has a variable gate time that functions as a multiplier. Provision for a second input permits measuring ratios of two independent variables to obtain (for example) engine revolutions per gallon.—*Hewlett-Packard Co.,* 395 *Page Mill Road, Palo Alto, Calif.*

For more information circle **338** on inquiry card.

FREQUENCY COUNTER

New "Model 7340A," developed specifically for industrial applications, counts mechanical and electrical



8025

events and measures their repetition rate; is said to be "ideal for such applications as rpm measurement, oscillator calibration, direct counting, and

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High-speed photography—principles, techniques, and applications. Learn the new techniques made possible with high-speed photography.

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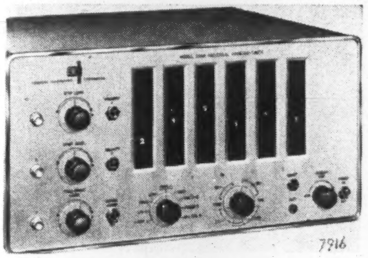
at the **CLINIC FOR OPTICAL TECHNIQUES** at the Third Automation Exposition. See page 1970 for registration coupon.

flow measurement." Automatic decimal point location; 1 to 9,999 events per second; reliable circuitry. For applications requiring a permanent record of readings, "Model 7341A" (shown) has outputs for driving a serial type print-out.—*Electro-Pulse, Inc.*, 11861 *Teale St., Culver City, Calif.*

For more information circle **339** on inquiry card.

1-MC COUNTER TIMER

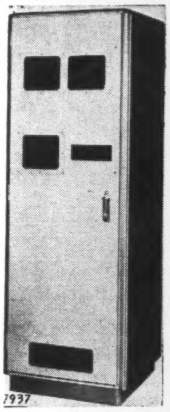
New "Model 226A Universal Counter Timer" measures frequency, frequency ratio period (1/*f*) and time interval. Pressure, velocity, acceleration, displacement, flow, rps, rpm, etc., can be measured with suitable pickups. Major features: simplified color-coded controls; direct read-out in kc, Mc, seconds or milliseconds with automatic decimal point indication.—*Computer-Measurements Corp.*, 5528 *Vineland Ave., N. Hollywood, Calif.*



For more information circle **340** on inquiry card.

COMPUTING AND DATA PROCESSING

RADAR DATA PROCESSOR



New "Model 325" radar data reduction system reduces analog range, azimuth and elevation data to digital form on punched cards. Speeds of 60 readings per second on each of three independent data channels permit near continuous reading of input data or scanning of multiple data sources. Readings are made to four significant figures. — *Franklin Electronics Inc., Dept.* 151, *PO Box* 113, *Bridgeport, Pa.*

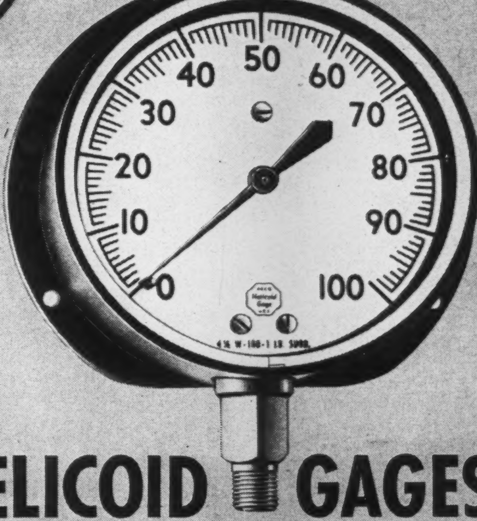
For more information circle **341** on inquiry card.

BALLISTIC FILM READER

New "Powered Comparator" features a fixed-scale measuring system. Precision lead screw and nut driving a decimal "Digitizer" provide a least count equivalent to 10 microns. All digital measurements are made at film and not on projected image, so that machine precision and scale accuracy

an ACCO product

Helicoid Gages



How HELICOID GAGES can save YOU money!

LONG LIFE:

HELICOID Gages are pressure instruments of extreme precision and long, trouble-free service with minimum maintenance. Have no gear teeth to wear out.

SUSTAINED ACCURACY:

HELICOID Gages have many unique and exclusive features which result in the highest degree of gage accuracy. Tubes, for instance, will withstand hundreds of thousands of pressure pulsations and will not stretch, leak or crack.

JOB-DESIGNED:

HELICOID Bourdon tubes are made from seamless tubing of alloy steel, K Monel, stainless steel or phosphor bronze. Each is designed to give best service under specific conditions. Available in complete line of cases for wall or stem mounting.

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Helicoid Chemical gage

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Helicoid Gage Division
AMERICAN CHAIN & CABLE
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for Better Value

For more information circle **112** on inquiry card.

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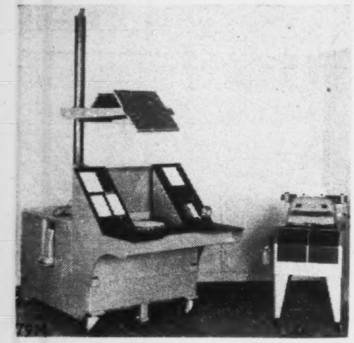
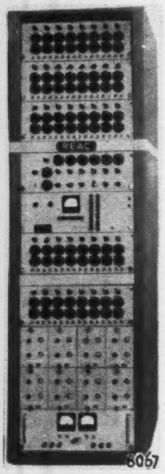
For more information circle **113** on inquiry card.



are independent of magnification. "Digitizer" permits readout into any combination of card punches, paper tape perforators, or electric typewriters. Comparators are available to handle any configuration of film size up to 5½" wide, including film from pin-registered cameras.—*Coleman Engineering Co., Inc., 6040 W. Jefferson Blvd., Los Angeles 16, Calif.*

For more information circle **342** on inquiry card.

FUNCTION GENERATOR

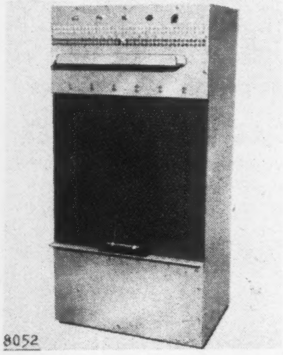


New 5-channel "DFG 401 REAC Diode Function Generator" can generate functions of two or more variables; is self-contained except for relay and reference supplies; is well suited as an addition to an existing computer installation; allows direct generation of slopes up to 12 without paralleling of segments. Functions once set up can be reproduced later by resetting 1000-division dials to their previously-recorded values.—*Reeves Instrument Corp., 207 E. 91st St., New York 28, N. Y.*

For more information circle **343** on inquiry card.

STOCHASTIC GENERATOR

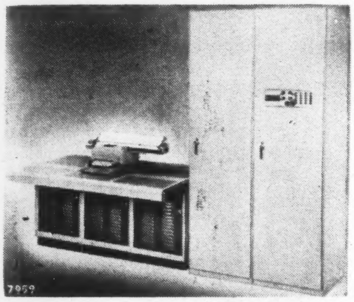
New Stochastic Generator saves much time in obtaining truly random numbers; obviates need of transcribing by hand from tables or drawing numbers from a bowl. Rate of continuous generation of random numbers is 10 per second. New device can generate normal as well as rectilinear distributions.—*Loyola Labs., Box 45074 Airport Sta., Los Angeles 45, Calif.*



For more information circle **344** on inquiry card.

ELECTRONIC DATA LOGGER

New data logger incorporates advanced techniques which simplify over-all system and enhance inherent accuracy and reliability. Accuracy is conservatively guaranteed 0.2% for all inputs, including non-linear types. Reliability is claimed because of (1) complete absence of mechanical operations except for normal complement of high-quality sealed relays and (2)



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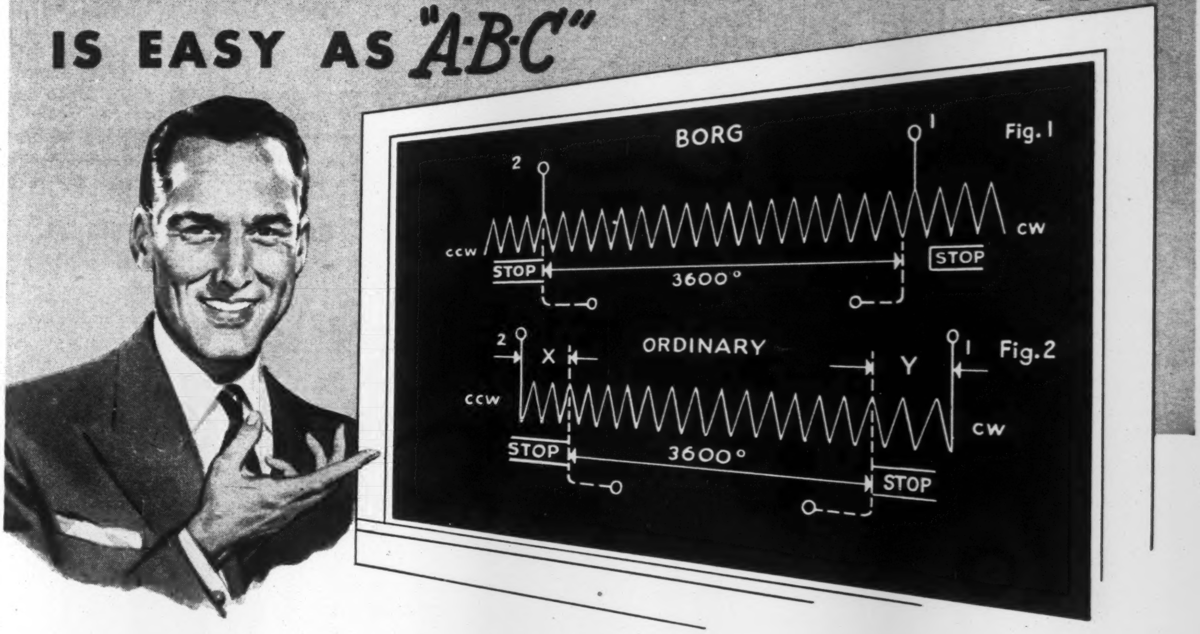
TRIMMING ANY BORG MICROPOT IS EASY AS "A·B·C"



Borg Micropots Reduce Assembly Costs With Simplified Trimming of Borg Independent Linearity

All Borg independent linearity MICROPOT Potentiometers may be trimmed at one end only. They will then produce an output voltage within the linearity tolerance of the potentiometer.

BORG MICROPOTS

This is readily illustrated in Figure 1, on the blackboard. The mechanical stops in all Borg MICROPOT Potentiometers with independent linearity, are set beyond the position of each terminal 1 and 2. This allows the contact to travel to the last active turn at either end of the winding. Thus, by positioning the contact at one end point, trimming of that end is not required.

ORDINARY POTENTIOMETERS

Note the mechanical stops in Figure 2. This is an ordinary potentiometer. The mechanical stops are set to prevent the contact from reaching the last active turn, causing "end resistances" X and Y, at either end. Both resistances X and Y must be trimmed to produce voltage outputs within the linearity tolerance of the potentiometer.

TRIMMING COST

The fact that, in Borg MICROPOT Potentiometers, one end can be set up without trimming eliminates the selection of fixed trimming resistors for that end, as well as the time for selection and installation required by ordinary potentiometers.

The maximum portion of the total resistance at the opposite end that would require trimming in Borg MICROPOT Potentiometers is .4%. This is 20% less than in ordinary potentiometers, which substantially reduces the selection of fixed trimming resistors required for use with higher linearity potentiometers.

Lower linearity tolerances may require no trimming whatsoever at either end.

POTENTIOMETER APPLICATIONS

Definitions of potentiometer parameters vary from manufacturer to manufacturer, thus causing misconception to the user. A set of tentative standard definitions has been adapted by RETMA and all Borg MICROPOT Potentiometer tolerances are written for interpretation under these definitions.

The "Trimming Costs" economy in potentiometer application is a typical example of the savings, and in many cases superior performance, achieved through a clear understanding of manufacturing specifications and user requirements.

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BORG EQUIPMENT DIVISION
THE GEORGE W. BORG CORPORATION
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BORG
EQUIPMENT

Built by Borg

For more information circle **114** on inquiry card.

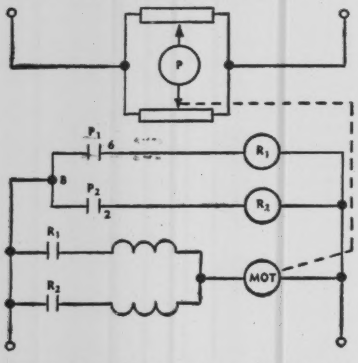
BARBER COLMAN

ultra-sensitive relays

HELPFUL DATA FOR YOUR CIRCUITRY IDEA FILE...

(No. 2 in a series by Barber-Colman Company)

The circuit drawing below indicates just one of the hundreds of ways many manufacturers are utilizing Barber-Colman Micropositioner ultra-sensitive relays to solve complex control problems. Could this be the answer to some of yours, too?



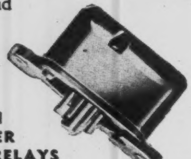
SERVOMECHANISMS APPLICATIONS

Many remote positioning applications can be solved by utilizing the Barber-Colman Micropositioner ultra-sensitive relay either as a null detector or a differential relay.

In the circuit shown above, movement of the transmitting potentiometer introduces an error signal in Micropositioner coil P, which in turn energizes the positioning motor until balance is restored. Secondary relays R_1 and R_2 operated by the Micropositioner handle larger loads. This circuit can also be applied to synchronization . . . or the Micropositioner can be utilized in the output of an electronic servo control.

Among the many applications for this simplified servo control relay are positioning of antenna rotators and tuning condensers . . . aerial camera mounts . . . valves . . . test cell apparatus.

If your projects involve servomechanisms, why not make a test with a Micropositioner designed for circuits similar to that shown above? Write for technical bulletins F7279 and F3961-5.



BARBER-COLMAN MICROPOSITIONER POLARIZED DC RELAYS

Various types...plug-in, solder-lug, screw terminal, hermetically sealed. Operate on input powers of 50 to 1,000 microwatts for use in photoelectric circuits, resistance bridge circuits, and electronic plate circuits. Send for data.

Barber-Colman Company

Dept. J, 1415 Rock Street, Rockford, Illinois

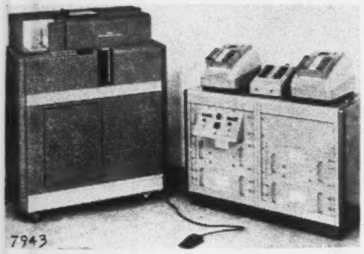
For more information circle **115** on inquiry card.

hermetic sealing providing Class I, Division 2 classification. Digitizing is effected by sweep comparison circuits operating an electronic gate which passes discrete crystal oscillator counts to magnetic storage in decimal form.—*The Kybernetes Corp., 9 E. 40th St., New York 16, N. Y.*

For more information circle **345** on inquiry card.

MANN COMPARATOR DATA PROCESSOR

New system provides extremely accurate digital recording of both *X* and *Y* axes from a Mann Comparator.



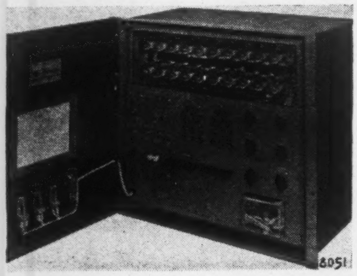
7943

Shaft positions are digitized by means of "Datex" encoders whose output is fed into standard "Datex" modular storage and control units which translate binary code into Arabic decimal. —*G. M. Giannini & Co. Datex Div., 918 E. Green St., Pasadena 1, Calif.*

For more information circle **346** on inquiry card.

PUNCHED TAPE CONVERTER

New addition to maker's line of converters for operating an *X-Y* Plotter from digital inputs operates from a punched tape reader; is designed to accept data from output punched paper tape of "Electrodata Datatron Computer" but can be modified to operate with any other digital computer furnishing a paper tape output such as maker's "LGP-30." (If a printed listing is desired in addition to the plot, unit can be operated from a tape-actuated typewriter.)—*Librascope, Inc., Glendale 1, Calif.*

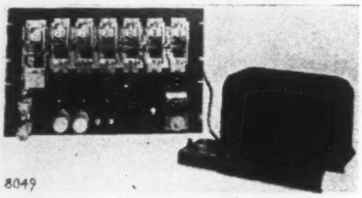


8051

For more information circle **347** on inquiry card.

DATE AND TIME SIGNAL GENERATOR

New date and time signal generator, for data logging or communication systems, provides a Teletype line signal consisting of day, month, year, hour, and minute and a number of other preset characters on demand. A separate neon lamp panel is available for remote indication of clock setting. ★ Variation of signal generator can accumulate a count, such as "barrels delivered" (up to 999999) and then transmit this total on demand.—*L and R Products, 52 Lake Road, Framingham, Mass.*



8049

For more information circle **348** on inquiry card.

PULSE GENERATOR

New "Type 1050" is a stable source of pulses usable in digital techniques at extra-high frequencies; has independent controls for pulse frequency, duration, amplitude, and polarity. Output is a ½ sinewave covering an adjustable range from 1.6 to 10.4 Mc in four overlapping bands; pulse

8011

Want to know more about **ELECTRONIC, HYDRAULIC, PNEUMATIC AND ELECTROMECHANICAL TECHNIQUES?**

You can learn about . . .

Analyzing applications for pneumatic and hydraulic equipment in automatic operations. *Presented by Modernair Corp., in Room* 343

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Application of scopes and scanners to automatic control systems, e.g. flaw detection in continuous processing. *Presented by Allen B. Du Mont Labs., in Room* 339

Characteristics and applications of syncroverters, choppers and high-speed relays in automation. *Presented by Bristol Company, in Room* 301

TV and wide-band data transportation and distribution systems, and remote control equipment. *Presented by Jerrold Electronics Corp., in Room* 407

at the **CLINIC FOR ELECTRONIC, HYDRAULIC, PNEUMATIC, AND ELECTROMECHANICAL TECHNIQUES** at the Third International Exposition. See page 1970 for registration coupon.

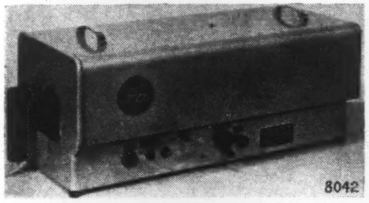
width adjustable from 0.03 to 0.07 usec in five bands; amplitude adjustable from 10 to 32 v with either polarity.—*Burroughs Corp., Electronic Instruments Div.,* 1209 *Vine St., Philadelphia* 7, *Pa.*

For more information circle **349** on inquiry card.

LABORATORY EQUIPMENT

SCANNING SPECTROMETER

New "Model 8200 Jaco-Ebert" low-cost 0.5-m grating type scanning spectrometer, said to surpass conventional instruments in "both dispersion and resolution," features first-order reciprocal linear dispersion of 16 Angstroms/mm at exit slit, minimum resolution 0.2 Angstroms; is easily adapted for use as a flame spectrometer; can detect impurities to one part per billion. Among features is a linear wave-length scanning mechanism which requires only a Veeder-Root counter.—*Jarrell-Ash Co.,* 26 *Farwell St., Newtonville* 60, *Mass.*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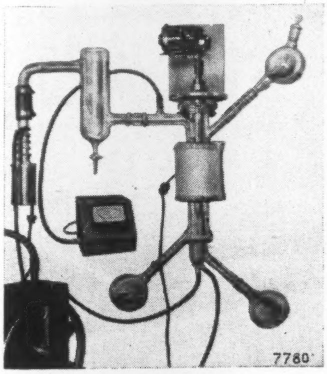
For more information circle **350** on inquiry card.

MOLECULAR STILL

New simplified two-inch version of "Rota-Film Molecular Still" offers a relatively inexpensive method of molecular distillation for user who does not require great capacity of full-size models; is especially useful as their lab counterpart since results can be duplicated on any commercial scale.—*Arthur F. Smith Company, Rochester* 3, *N. Y.*


7780

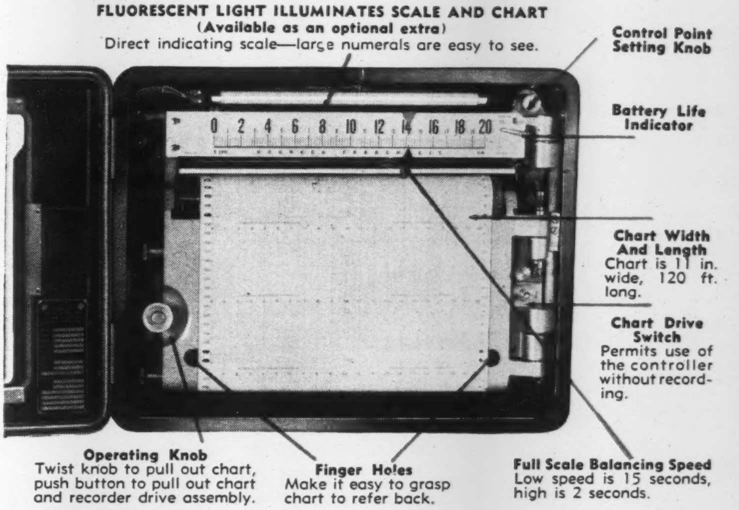
For more information circle **351** on inquiry card.

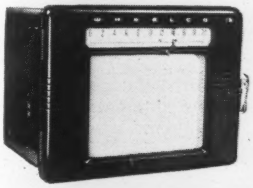
LABORATORY STIRRER

New "#69" stirrer can also serve as a shaker drive for Van Slyke apparatus and separator funnel extractions. Maximum output torque 1 to 2 pound-inches; 10:1 bronze gear re-

THE MARK OF QUALITY
BARBER COLMAN
Wheelco Instruments

New Series 8000 Potentiometer-Recorder ..tops in accessibility and ease of adjustment


FLUORESCENT LIGHT ILLUMINATES SCALE AND CHART
(Available as an optional extra)
Direct indicating scale—large numerals are easy to see.
Control Point Setting Knob
Battery Life Indicator
Chart Width And Length
Chart is 11 in. wide, 120 ft. long.
Chart Drive Switch
Permits use of the controller without recording.
Operating Knob
Twist knob to pull out chart, push button to pull out chart and recorder drive assembly.
Finger Holes
Make it easy to grasp chart to refer back.
Full Scale Balancing Speed
Low speed is 15 seconds, high is 2 seconds.
0 2 4 6 8 10 12 14 16 18 20



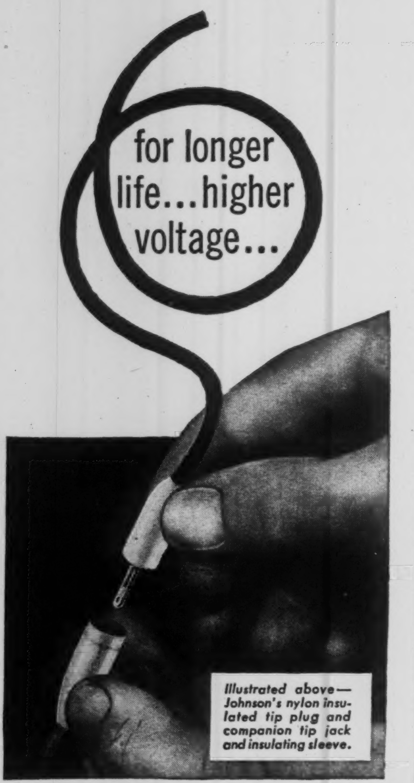
Accessibility and ease of adjustment were primary design considerations when Wheelco developed the new Series 8000 Potentiometer-Recorder. While every Wheelco instrument is built to function with maximum accuracy and minimum maintenance, this new null-balancing type electronic recorder was designed to be especially easy to use.

The front cover swings open 180 deg, thus permitting the chart drive to swing out a similar 180 deg, making the internal mechanism accessible. Wheelco Series 8000 Potentiometer-Recorder is available to measure, indicate, control, and give permanent record of variables such as temperature, speed, strain, hydrogen ion (pH), and any other quantities which can be resolved into electrical signals.

Send for new catalog which gives complete technical information on this latest Wheelco instrument.

WHEELCO INSTRUMENTS DIVISION
Barber-Colman Company
Dept. J, 1515 Rock Street, Rockford, Illinois
BARBER-COLMAN of CANADA, Ltd., Dept. C, Toronto and Montreal, Canada

For more information circle **116** on inquiry card.


for longer life...higher voltage...

Illustrated above—Johnson's nylon insulated tip plug and companion tip jack and insulating sleeve.

Solderless Nylon Connectors

(Available in 11 bright colors)

- Shock-proof nylon sleeves—won't chip or crack with the hardest usage.
- Excellent for high voltage applications.
- Highly resistant to extremes of heat, cold and moisture.
- Tip and banana plugs designed for simplified solderless connection of up to 16 gauge stranded wire. Jacks require soldered connection.
- Economical—simple, functional design gives you top quality at low cost.

SPECIFICATIONS

BANANA PLUG—Nickel-plated brass construction with nickel-silver springs. Spring plug is .175" diameter, fits all standard banana jacks.

TIP PLUG—Recessed metal head is fully insulated. Metal parts are brass, nickel-plated. Pin is .081" diameter—fits all standard tip jacks.

NYLON TIP JACK AND INSULATING SLEEVE—Complete assembly includes standard nylon tip jack with threaded nylon insulating sleeve. Ideal for patch cords or for panel mounting where an insulated rear connection is desired.

Write for samples, prices and further information.

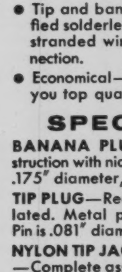
Pilot Lights

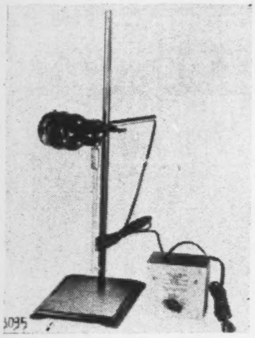
Available in a wide variety of types; Johnson Pilot Lights are stocked by parts distributors throughout the country. Available types include: continuous indication neon types; models for high and low voltage incandescent bulbs; standard or wide angle glass and lucite jewels in clear, red, green, amber, blue, or opal lenses. Specials, including those meeting military specifications are also available in production quantities. For full information, write to:

E. F. Johnson Company

2708 SECOND AVE. S.W. • WASECA, MINN.

For more information circle **117** on inquiry card.



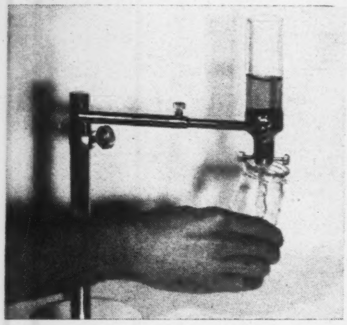


ducer; 100 to 1200 rpm in eleven steps. Tapped autotransformer gives better speed regulation than a rheostat without heat loss.—*Gerald K. Heller Co., 1 N. Carey St., Baltimore 23, Md.*

For more information circle **352** on inquiry card.

SPECIFIC-GRAVITY TESTER

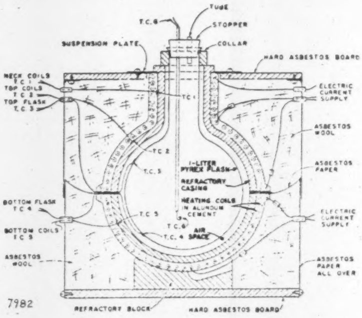
New "Graviometer," for making rapid specific-gravity measurements in lab without technician's hands coming in contact with the fluid, has particular usefulness in measurement of acids, milk, urine, etc.—*Royco Instruments, 818 Arthur St., Albany, Calif.*



For more information circle **353** on inquiry card.

SELF-IGNITION APPARATUS

New "Setchkin Self-Ignition Apparatus," for testing spontaneous ignition temperatures of combustible liquids, comprises an insulated spherical flask, designed to provide conditions favorable to low ignition temperature values; is well insulated to prevent heat loss; is capable of obtaining reproducible results.—*Research Appliance Co., Box 307, Allison Park, Penna.*


TUBE
T.C.6
STOPPER
SUSPENSION PLATE
COLLAR
HARD ASBESTOS BOARD
NECK COILS T.C.1
TOP COILS T.C.2
TOP FLASK T.C.3
T.C.1
ELECTRIC CURRENT SUPPLY
ASBESTOS WOOL
T.C.2
T.C.3
1-LITER PYREX FLASK
ASBESTOS PAPER
REFRACTORY CASING
HEATING COILS IN ALUNDUM CEMENT
BOTTOM FLASK T.C.4
T.C.5
T.C.6
ELECTRIC CURRENT SUPPLY
BOTTOM COILS T.C.5
T.C.4
AIR SPACE
ASBESTOS WOOL
ASBESTOS PAPER ALL OVER
7982
REFRACTORY BLOCK
HARD ASBESTOS BOARD

For more information circle **354** on inquiry card.

COMBUSTION BOATS

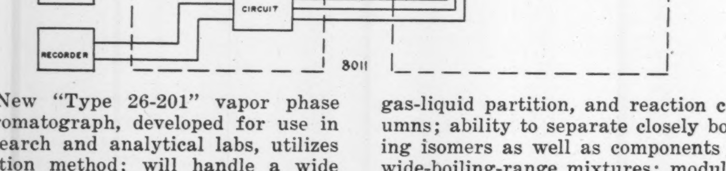
New improved heavy-duty combustion boats, made of highest available grade zircon silicate, are heat-shock resistant, carbon- and sulphur-free, and resist penetration of stainless steel and silicon steel slags. Standard sizes stocked for immediate shipment.—*Saxonburg Ceramics, Bock St., Saxonburg, Pa.*

For more information circle **355** on inquiry card.

LAB VOLTAGE REGULATOR

New "Model MXP-3000" all-magnetic 400-cycle ac line voltage regulator delivers a sinoidal output despite ac input distortions; is said to "fill a long-standing laboratory need for equipment that can maintain a con-

RESEARCH AND ANALYTICAL CHROMATOGRAPH


FLOW METER
SAMPLE IN
DETECTOR
VALVE
SYRINGE INJECTION POINT
FLOW REG.
FLOW CONTROLLER
SAMPLE OUT
CONTROL UNIT
ANALYZER
POWER SUPPLY
DETECTOR CIRCUIT
RECORDER
8011

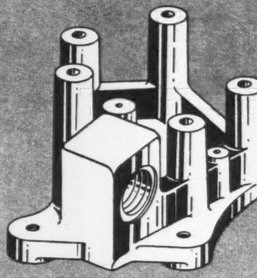
New "Type 26-201" vapor phase chromatograph, developed for use in research and analytical labs, utilizes elution method; will handle a wide variety of compounds including liquids with boiling points up to 325°C. Versatility: ability to use micro-samples and to operate with adsorption, gas-liquid partition, and reaction columns; ability to separate closely boiling isomers as well as components in wide-boiling-range mixtures; modular design for future expansion.—*Consolidated Electrodynamics Corp., 300 N. Sierra Madre Villa, Pasadena, Calif.*

For more information circle **356** on inquiry card.

HEISE GAUGES

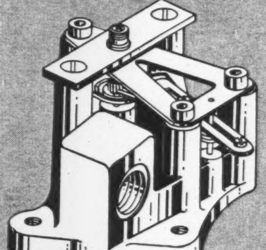
☆ Massive bronze base

☆ Tube socket integrally cast



☆ Main frame completely contains precision machined integral movement

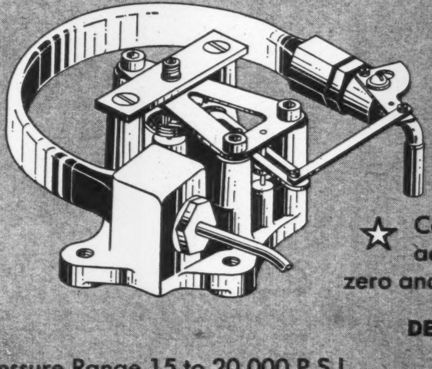
☆ Dial mount and pivot supported from base isolates dial from movement



☆ Special sleeve bushings isolate pressure medium from tube socket

☆ One piece weldless Bourdon Tube machined from solid stock

☆ Designed to eliminate Hysteresis and Creep



☆ Patented External Bleeder

☆ Convenient external adjustment of dial zero and many other features

Precision... begins behind the dial

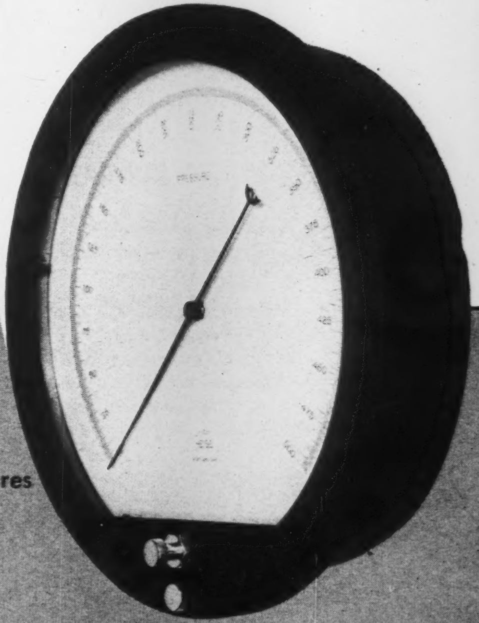
Behind the dial of the Heise gauge lies an instrument known throughout the world for high precision and dependable service under the most demanding conditions.

Accurate and dependable performance requires simplicity of design, rigidity of supporting structure and firmly integrated mechanism.

These features appear in their most highly developed form in the Heise gauge.

The Heise integral movement consists of a solid, massively designed bronze casting which with a one piece cover plate completely contains and supports all moving parts of the gauge. The dial and case are each independently mounted on this casting and completely isolated from the movement.

The Bourdon Tube in the Heise gauge is of weldless one piece construction, an exclusive Heise feature, and is custom designed to provide a length width ratio for optimum performance in each specific application.



DELIVERY WITHIN 30 DAYS

Pressure Range 15 to 20,000 P.S.I.

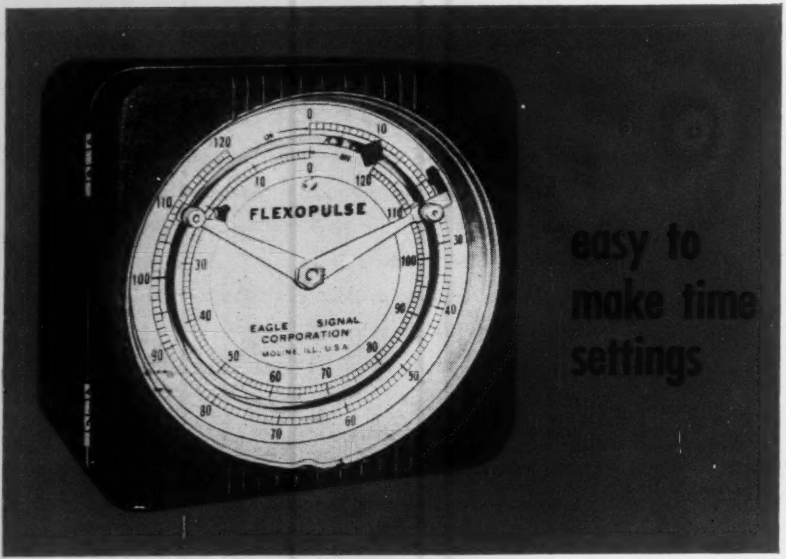
Dial Sizes 8½"-12"-16"—Prices from $151.60

HEISE BOURDON TUBE COMPANY, INC.

BROOK ROAD, NEWTOWN, CONNECTICUT, U.S.A.

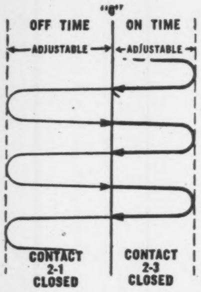
For more information circle **118** on inquiry card.

EAGLE FLEXOPULSE
repeat cycle timer
WITH S.P.D.T. SWITCH



No gear change or resetting of cams required

This Flexopulse Repeat Cycle Timer is ideal for controlling processing machines requiring adjustable timed cycles. The "on" or "off" intervals are easily adjusted. Either can be adjusted without disturbing the setting of the other. Instead of resetting cams or changing gears, simply loosen two knurled nuts. Then set "on" and "off" periods by moving two adjustable arms. Tighten screws, and the job's done.



HAS CYCLE PROGRESS INDICATION:

A movable flag indicator passing over the time scale between adjustable arms, indicates portion of cycle elapsed in either of the s.p.d.t. positions. Switching operation takes place at zero.

Flexopulse is ideal for periodically operating valves to reverse the flow of liquids, for operating signals or for injecting chemicals. 120-second up to 20-hour dials are available. Synchronous motor powered. Send coupon today for free bulletin 320.

EAGLE TIMERS SAVE TIME . . . SAVE MONEY
EAGLE
SIGNAL CORPORATION
Industrial Timers Division
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Please send free Bulletin 320 with full data on Flexopulse Repeat Cycle Timer.

NAME AND TITLE ____
COMPANY ____
ADDRESS ____
CITY ____ ZONE ____ STATE ____

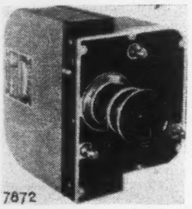
For more information circle **119** on inquiry card.

stant 400-cps line voltage regardless of line or load variations," also eliminates interference between sections of a lab where a single 400-cps supply is used. Time response 10 milliseconds for 100% load change; static regulation 0.5 v from 395 to 405 cps and 1 v from 380 to 420 cps. Load can be varied from 0 to 25 amp without changing output voltage more than stated amount. Output voltage continuously adjustable between 110 and 120 v; no danger of output overvoltages.—*Magnetic Research Corp.*, 200 *Center St., El Segundo, Calif.*

For more information circle **357** on inquiry card.

PHOTOGRAPHY

35-MM RECORDING CAMERA

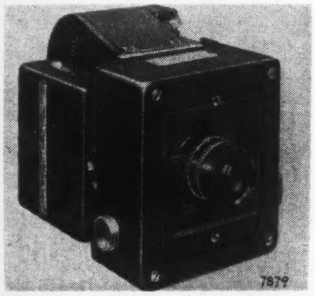

7872

New "Type 232 MK7 Instrumentation Camera" is said to have been designed as "the most flexible camera in the field of instrumentation and air photography." Feature: Main components and assemblies are designed on module system to make conversion simple. Magazine takes 100 ft 35mm standard sprocketed film, No. 10 daylight loading spool. (400 ft. magazine on special order). Interval time 3 cps maximum.—*Norden-Ketay Corp.*, 99 *Park Ave., New York, N. Y.*

For more information circle **358** on inquiry card.

RECORDING CAMERA

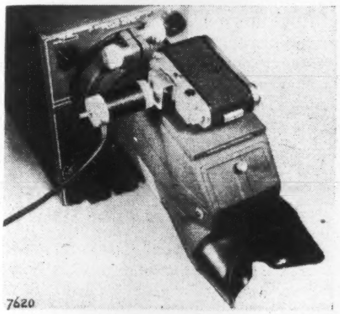
New model of "Beattie Varitron Model D" instrumentation camera features front mounting to facilitate rigid mounting to structures; comes with a group of interchangeable lenses in focusing mounts. About twenty types of 35mm and 70mm film size magazines. Provision is also made to attach standard supplementary data recording system to record one or all of: time (sweep-second-hand clock); sequence of numbers (electric counter); and information (written).—*Photographic Products Inc.*, 1000 *No. Olive St., Anaheim, Calif.*


7879

For more information circle **359** on inquiry card.

OSCILLOGRAPH CAMERA

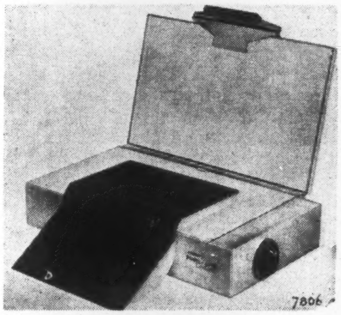
New "Type 352" oscillograph record camera for single-frame recordings automatically advances film frames in rapid sequence, at random, or at synchronized intervals; has a seven-element Wollensak f/1.5-50-mm lens; uses standard 35-mm film.—*Allen B. Du Mont Labs., Inc.,* 750 *Bloomfield Ave., Clifton, N. J.*



For more information circle **360** on inquiry card.

BOOK COPIER

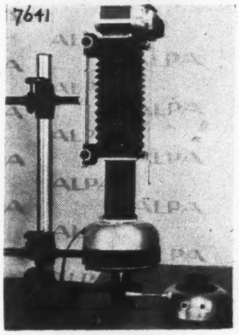
New "Apeco Panel-Lite Copier," especially designed to copy pages from books and magazines (as well as other material requiring a flat-bed printer); has a built-in automatic timer.—*American Photocopy Equipment Co.,* 1920 *W. Peterson Ave., Chicago 26, Ill.*



For more information circle **361** on inquiry card.

CLOSE-UP STAND

New "Alpa-Macrostat" copying and close-up stand is said to be "of amazingly flexible application in copying



every lab NEEDS one!

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ideal for:

- GENERAL LABORATORY WEIGHINGS
- A PREWEIGHER to speed results and save wear and tear on analytical balances.
- CAPACITY . . . 311 gram
- SENSITIVITY . . . .01 gram (1 centigram)

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TRIPLE BEAM BALANCE
Model C.G.311

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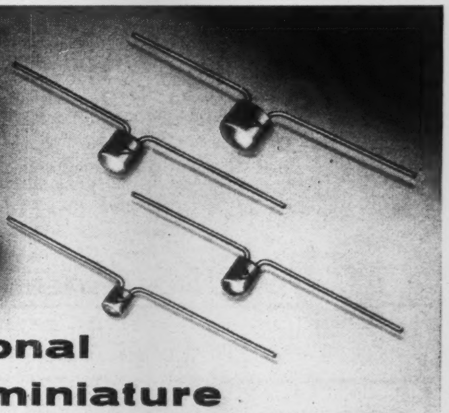
For more information circle **120** on inquiry card.



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applications . . .

International
subminiature
selenium diodes

These subminiaturized and ruggedized selenium diodes are produced to withstand the most rigid environmental requirements. Encapsulated within a thermosetting plastic for complete protection, they offer stable operation in a temperature range from −50°C to +100°C, with output voltages from 20 to 160 volts and output currents from 100 microamperes to 11 milliamperes.

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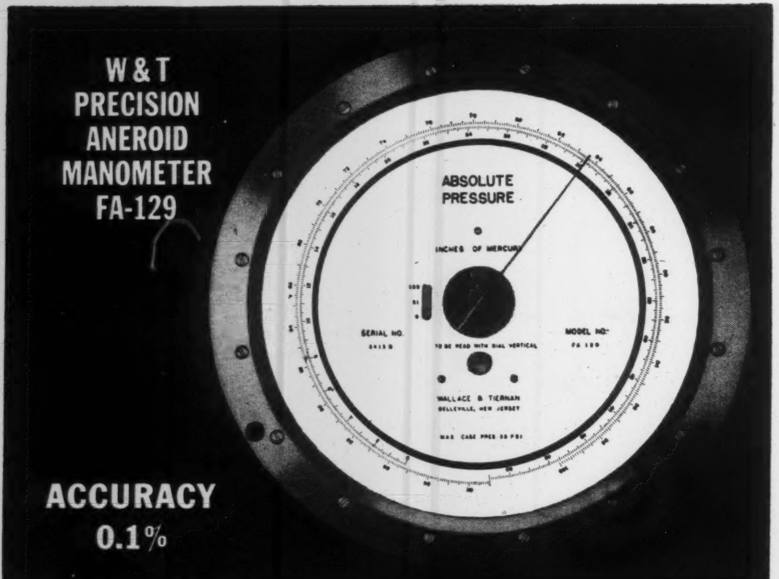

PRECISE CALIBRATING STANDARD
...For Absolute Pressure Work

Ranges: 0 to 31.5 inches of Hg. absolute (min.)
0 to 100 inches of Hg. absolute (max.)
Other intermediate ranges available

Accuracy: 1/1000 of full scale

Sensitivity: 1/10,000 in *all* ranges

Scale Length: 45 inches in two revolutions

Dial Size: 8½ inch diameter

Write for Publication No. TP-15-A

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3 PARTS CHLORINE
IN A MILLION PARTS AIR

New W&T Solvay Chlorine Detector*

detects as little as 3 p.p.m. chlorine in a continuous air-stream sample. Automatically sets off alarm at higher concentrations.

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I-55 *Manufactured under patent license from Solvay Process Div., Allied Chemical & Dye Corp.

For more information circle 122 on inquiry card.

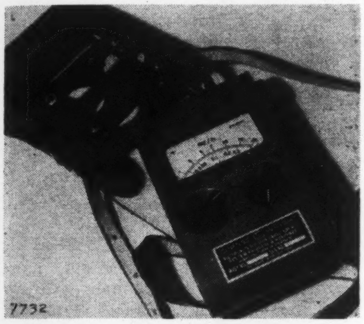
prints, posters, or pages; in reproducing small objects like stamps, coins, or gems to exact scale; in obtaining large-scale close-ups of flowers or insects in their natural habitat—and many other uses."—*Karl Heitz Inc.*, 480 *Lexington Ave., New York* 17, *N. Y.*

For more information circle **362** on inquiry card.

NUCLEONICS

HEALTH MONITOR

New "Radiameter" (German-made) detects and measures potentially hazardous atomic radiation in industry or x-rays in medicine, weighs 2 lb; fits into a suit coat pocket; operates on a flashlight battery. Its simplicity enables plant personnel to make checks with minimum supervision from the health physicist or industrial hygienist.—*Curtiss-Wright Corp., Electronics Div., Carlstadt, N. J.*

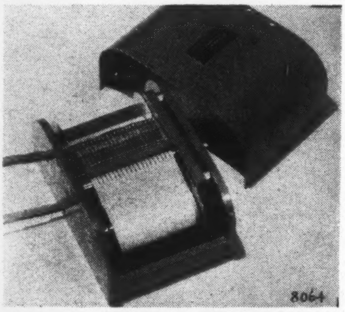

7732

For more information circle **363** on inquiry card.

FOR AIRCRAFT AND MISSILES

RECORDER FOR MISSILES

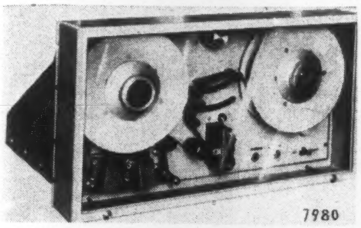
New "Event Recorder." for missile use, features ability to withstand severe shock. (In test it has recorded through shocks in excess of 3000 *G*.) It weighs less than 6 lb; can record up to 21 channels on electrosensitive papers. Various chart speeds available. Governor-controlled motor available for battery operation.—*Photron Instrument Co.*, 6516 *Detroit Ave., Cleveland* 2, *Ohio.*


8064

For more information circle **364** on inquiry card.

AIRBORNE MAGNETIC TAPE HANDLERS

New "Model 3186," for operation on either 60- or 400-cps power, uses standard 1" wide magnetic tape with



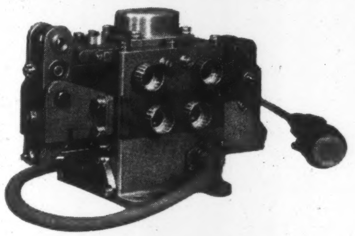
7980

an interlaced head stack arrangement that provides 25 data channels. Tape speed 54 ips on standard models; other tape speeds can be accommodated. Tape travel can be controlled by front panel switch or remotely.—*Potter Instrument Co., Inc., 115 Cutter Mill Rd., Great Neck, N. Y.*

For more information circle **365** on inquiry card.

POSITION-SERVO VALVE

New dual input servo valve for aircraft surface positioning employs a new summation principle; combines

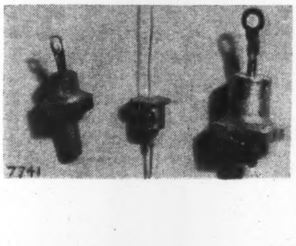


artificial flight stability augmentation and work of autopilots with pilot boost servos (usually mechanohydraulic); permit direct mechanohydraulic flight control, combined mechanohydraulic and electrohydraulic control, and electrohydraulic control alone. Full mechanical override for safety is always possible and self-contained solenoid and lock-out arrangements permit full flight mode selection.—*Moog Valve Co., East Aurora, N. Y.*

For more information circle **366** on inquiry card.

SILICON POWER RECTIFIERS

New line of silicon power rectifiers is said to be ideally suited for airborne electronic equipment, also wherever minimum size, high operating temperature and resistance to vibration and shock are required. Electrically, new units exhibit exceptionally low forward voltage drop when passing full



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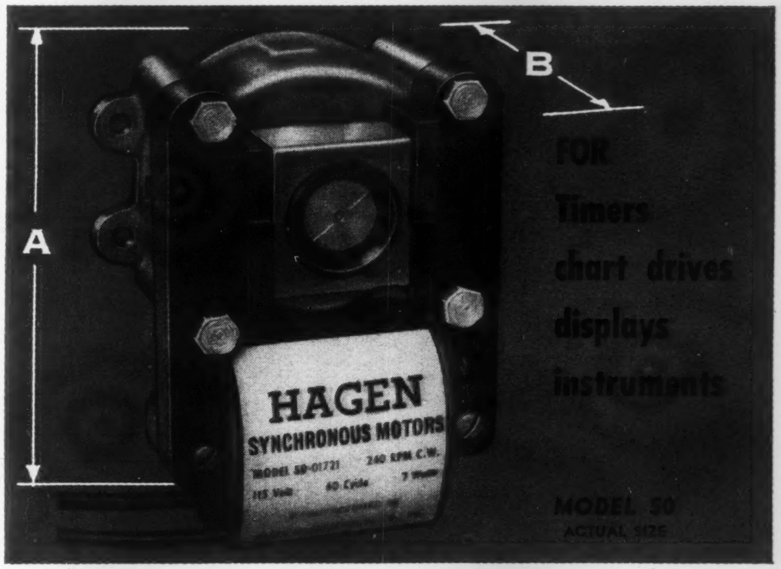
HAGEN
Synchronous motors



most powerful for its size

Laminated rotor construction of the Model 50 Hagen Motor produces exceptionally high torque. For example, the rotor develops 10 ounce inches torque at 4 RPM. This motor is ideal for those applications requiring from 5 to 10 times the power of clock-type miniature motors. Yet in spite of its power, the motor is extremely compact:

DIMENSIONS

	50 to 60 cycle	25 cycle
	3-3/32	3-1/16
	1-13/32	1-23/32

Just a few of the many possibilities for use are: door chimes, laundry timers, depth finders, animated displays, heating controls, program clocks, fire alarm systems, integrators, time switches, chart drives, scoreboards, potentiometer drives. Motor may be mounted in any position. Wide selection of output speeds from 1800 to 1/6th RPM. Reversible and other models available. Send coupon for Bulletin No. 1055.

MAIL COUPON TODAY

HAGEN

HAGEN MANUFACTURING COMPANY, INC.
Dept. IA-1056, Moline, Illinois

Please send Bulletin 1055 on Hagen Synchronous Motors.

NAME AND TITLE

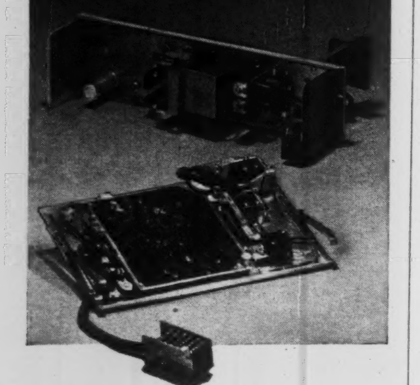
COMPANY

ADDRESS

CITY ZONE STATE

For more information circle **123** on inquiry card.

NOW YOU CAN BUY
MAGNETIC TAPE
Recorders
AND
Announcers



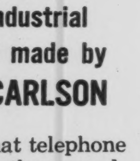
designed for industrial applications and made by STROMBERG-CARLSON

When you learn what telephone companies do with these products, a dozen applications to *your* problem will come to mind.

The XY Tape Recorder is used in connection with long-distance telephone calls for recording data on a sequential basis, and later reading out the information at very high speed. Mighty useful in data processing.

The Tape Announcer is used to substitute a pre-recorded message for interception by a telephone operator—in cases like wrong numbers dialed, discontinued numbers and the like. It can be used in conjunction with any communication system.

FREE catalog will be sent on request. Or write us regarding any specific problem you have right now.



S-C
STROMBERG-CARLSON
A DIVISION OF GENERAL DYNAMICS CORPORATION
TELEPHONE INDUSTRIAL SALES
113 CARLSON ROAD, ROCHESTER 3, N. Y.
For more information circle **124** on inquiry card.

rated forward current; and negligible leakage current.—*Federal Telephone & Radio Co., Components Div.,* 100 *Kingsland Rd., Clifton, N. J.*

For more information circle **367** on inquiry card.

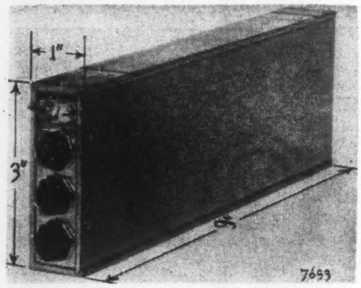
TIME BASE

New "Chronopulse," said to represent "an entirely new concept in chronometric governed time base . . . revolutionary development," is basically a pulse generator, providing a precise time base (millisecond accuracy) for use in dc voltage applications. It is a miniature modular component adaptable to multiple design applications; withstands extreme environmental conditions to provide accuracy and reliability as a timing unit for event, program or sequence in jet, rocket or missile operations.—*Abrams Instrument Corp.,* 606 *E. Shiawassee St., Lansing* 1, *Mich.*

For more information circle **368** on inquiry card.

SUPPLY FOR AIRBORNE USE

New subminiature power supply features unique transformer design and use of silicon rectifiers to insure high temperature operation in a small 36-oz package. With 115-vac 400-cps input, it provides 160 vdc at a nominal 100 ma and 6.3 vac at 5 amp.—*Land-Air, Inc., Oakland Airport, Oakland, Calif.*

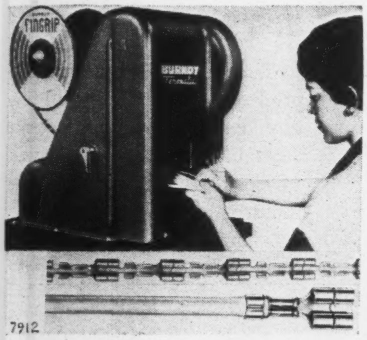


For more information circle **369** on inquiry card.

SHOP EQUIPMENT and SUPPLIES

TERMINATION MACHINE AND QUICK-DISCONNECT TERMINAL

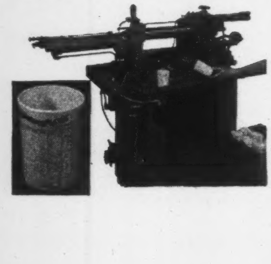
New "Termatic" automatically connects wire sizes 22 through 12 to new "Fingrip" quick-disconnect terminal; features less-than-15-second loading time; rate of 6000 an hour; no pedals or levers to press and no pre-positioning of wire: wire insertion actuates machine.—*The Burndy Engineering Co., Inc., Norwalk, Conn.*



For more information circle **370** on inquiry card.

MARKING MACHINE

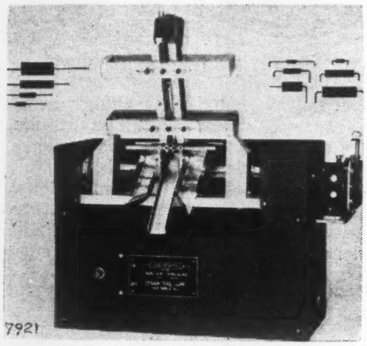
New "Model 9AH" marking machine with strength to mark steel, etc., is adaptable for marking of plastics with no change-over except slight adjustments; is driven by an air cylinder provided with foot or hand valve (which, in high production lines, can be electrically controlled).—*The Acromark Co.,* 543 *Morrell St., Elizabeth* 4, *N. J.*



For more information circle **371** on inquiry card

PIGTAIL FORMING MACHINE

New "Lead Bender" automatically prepares 14,000 axial leads per hour, bending them to right angles and cutting them to any length, equal or unequal. Easy adjustments permit rapid changes so that short runs don't waste production time.—*Design Tool Corp.,* 80 *Washington St., New York, N. Y.*

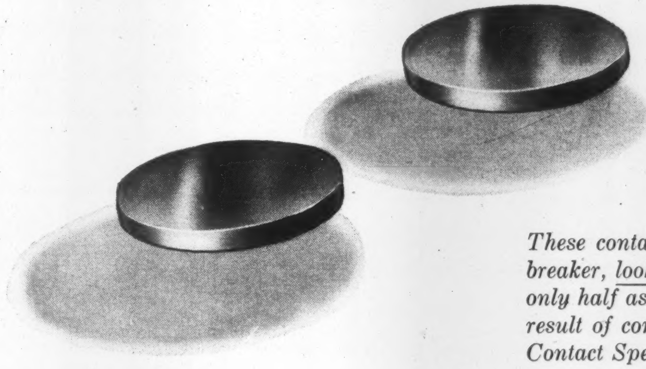


For more information circle **372** on inquiry card.

TUBE & BELLOWS MATERIAL

New special tubing for constant elasticity applications is made from "Ni-Span C", a nickel-chrome-titanium alloy developed by The International Nickel Co. Among characteristics: constant modulus of elasticity in temperature range from —50 to 150°F making it useful for Bourdon tubes, etc.; high strength combined with unusually low drift; low hyster-

MALLORY



These contacts, for a utility circuit breaker, look alike . . . but one costs only half as much as the other, as a result of consultation with Mallory Contact Specialists.

How Mallory Contact Engineering Balances Performance and Price

Mallory Contact Engineering Offers Five Ways To Improve Economy

1. **The most effective contact material** from the extensive line developed by Mallory. More economical alloys often can satisfy *actual* service conditions.
2. **The most economical contact design . . .** for your purchasing, production and product needs.
3. **The most economical backing material** . . . from a group of Mallory alloys developed for this use.
4. **The most economical backing member design . . .** in relation to contact and product design requirements.
5. **The most economical method of assembly** of contact and backing member.

By coordinating *all* these important elements of contact design, Mallory can help you put into effect a long-range plan for cutting contact cost and assuring peak performance.

CONTACTS can be *too good* for their intended service. Detailed study of a contact application, by Mallory engineers, often uncovers ways to design more closely to actual requirements . . . at substantial savings to the customer.

The contact pictured above is a typical example. Intended for use in a circuit breaker for utility distribution lines, it originally was designed with contacts made of heavy-duty silver ELKONITE®. At first glance, this exceptionally long-wearing, high conductivity metal appeared ideal to meet the customer's original specifications. But further investigation by Mallory contact engineers revealed that while contacts had to operate with absolute dependability, they did not have to function *frequently*.

On the basis of the actual frequency of service expected, Mallory engineers recommended a change to a copper ELKONITE . . . an alloy made of lower priced materials, and more economical to produce. Overall savings to this customer amounted to a 50% cut in contact costs. Moreover, there is no sacrifice in performance for the specific application.

Chances are that consultation by Mallory on your own contact applications can prove the source of interesting savings for you. Mallory engineers are well qualified by years of experience to analyze your requirements, to recommend materials from the extensive line of Mallory alloys, and to assist in overall design of contacts and assemblies. For a discussion, write or call Mallory today.

Expect more . . . get more from

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Serving Industry with These Products:

Electromechanical—Resistors • Switches • Tuning Devices • Vibrators
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For more information circle **125** on inquiry card.

SAVE DESIGNING AND MANUFACTURING TIME with these *Standard* COMPONENTS FOR *Special* MACHINES

COMPLETE your *special* production equipment faster with *standard* components from this extensive line. Highest precision and quality—many sizes available from stock. *Get complete details!*

STANDARD *Slide* ASSEMBLIES

Available in 52 types and sizes. *Basic Type* includes male and female members, gib and gib screws. *Assembled Type* also has return springs, stop screw, Neoprene shield and mounting holes. Sliding surfaces furnished either *Milled* or *Hand Scraped.* Widths from 2″ to 6″—lengths from 3″ to 16″.

STANDARD *Spindle* ASSEMBLIES

Available in *Collet Type* for 1/8″, 3/16″ and 1/4″ max. capacity collets; *Morse Taper Type* for No. 0 and No. 1 Morse taper shanks; and *Arbor Type* for shankless cutters with 0.375″ and 0.500″ center hole. *Standard Duty* has single row ball bearings at both ends; *Heavy Duty* has double row bearings at front.

WRITE now for FREE catalog!

RUSSELL T. GILMAN, Inc.

625 Beech Street
GRAFTON, WISCONSIN

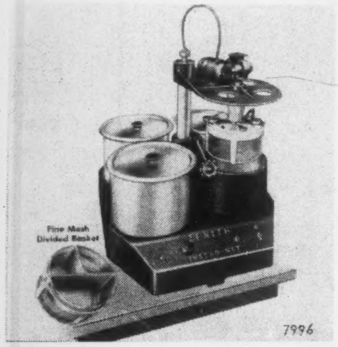
For more information circle **126** on inquiry card.

esis; uniform thermal expansion making it useful for instrument bellows, magnetostriction devices, etc.—*Superior Tube Co.*, 1564 *Germantown Ave., Norristown, Pa.*

For more information circle **373** on inquiry card.

PARTS CLEANERS

New "Instro-Met Strong Boy" industrial cleaning machine cleans small precision instrument and machine parts that require utmost care in handling; is of type used by watchmakers. —*Zenith Mfg. & Chemical Corp.*, 82 *Beekman St., New York* 38, *N. Y.*



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For more information circle **374** on inquiry card.

SILICONE COMPOUND

New "Compound 77-018" fully meets recent SAE spec AMS-3357 calling for a Silicone material that has lubrication oil resistance and good compression set qualities, and that is suitable for a temperature range of −65°F to 450°F.—*Rubber Products Div., Parker Appliance Co.*, 17325 *Euclid Ave., Cleveland* 12, *Ohio.*

For more information circle **375** on inquiry card.

PRINTED CIRCUIT KIT

New complete kit for accurate and simplified production of engineered or prototype models of printed circuit parts features a newly developed drawing pen obviating use of paints, tape, photosensitive coatings, negatives, etc. At least a dozen circuits can be produced with materials in new kit.—*Photocircuits Corp., Glen Cove, N. Y.*

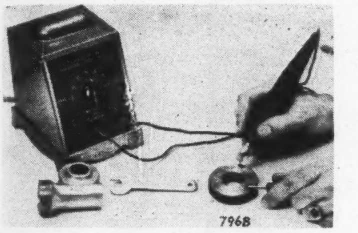
Photocircuits

7878

For more information circle **376** on inquiry card.

ELECTRIC PEN

New "Actograp" will efficiently arc-etch any ferrous or non-ferrous metal. Marking can only be removed by grinding, filing or destroying article. Exclusive control permits instrument to etch with lightness of a fountain pen.—*Newage International, Inc.*, 222 *York St., Jenkintown, Pa.*

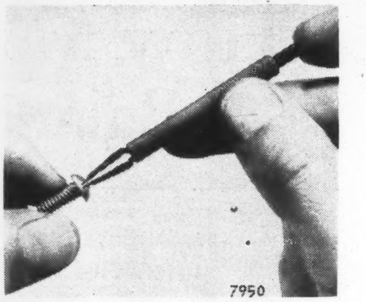


7968

For more information circle **377** on inquiry card.

SCREW-HOLDING DRIVER

New screw-holding driver prevents dropping screws, saves time and cuts costs. Exclusive twin bits expand to grip screw. Available in various lengths; blade widths of 3/16″, 9/64″, 0.102″, and blade thicknesses of 1/32″, 0.022″, and 0.014″ to handle from #0 to #1/4 slotted screws.—*H. J. J. Co.*, 268 *Marlowe Drive, Oakland* 5, *Calif.*



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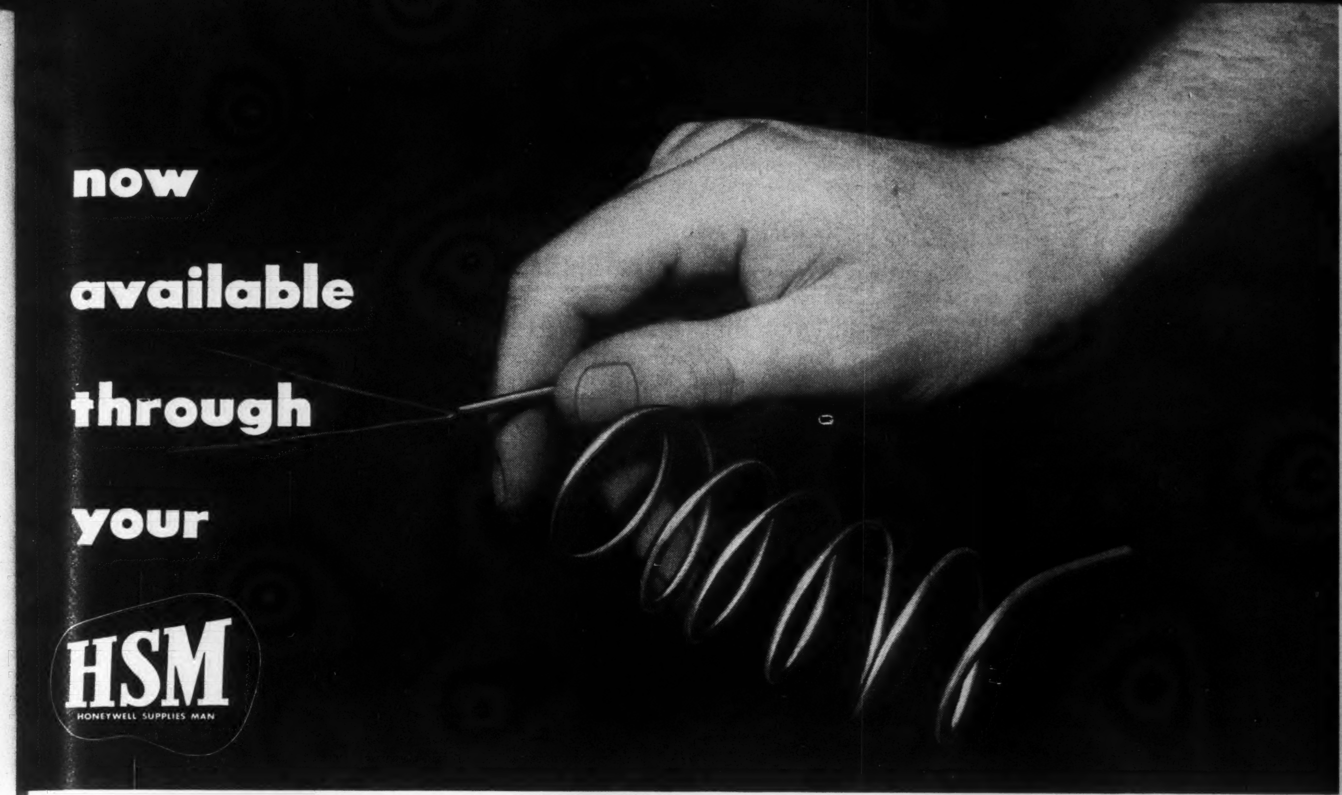
For more information circle **378** on inquiry card.

MAGNET CHARGER

New "Model 942" is a high-powered magnet charger capable of charging large Alnico and ceramic magnets, and other materials requiring large peak magnetizing forces. With its accessories, it can charge permanent magnets requiring up to 200,000 ampere-turns peak magnetizing force for

7981



Honeywell's New MEGOPAK* thermocouple wire small diameter . . . flexible . . . for use to 1400 F.

DESIGNED originally for atomic energy projects, this ceramic-insulated packed type thermocouple wire is now available to industry. *MEGOPAK* wire is the latest development in small-diameter thermocouples, with emphasis on durability and high accuracy. It consists of two wires, surrounded by pure magnesium oxide insulation and encased in a metal sheath. This construction insures high accuracy and long life.

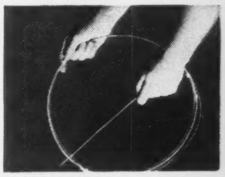
MEGOPAK wire is available in *Chromel Alumel*** and iron-constantan calibrations. Both can be supplied in either 1/16" or 1/8" diameter. The 1/8" wire is available with *Inconel* sheathing only, while the 1/16" wire is supplied with *Inconel* or 304 stainless steel.

Lengths up to 25 feet have a minimum resistance of 2.5 megohms at 500 V dc at room temperature, when checked wire to wire or wire to sheath. The wire is flexible enough to be bent around twice its diameter . . . versatile enough to serve in a broad range of applications . . . rugged enough to withstand severe mechanical abuse. Accuracy meets the recommended tolerances of the Instrument Society of America.

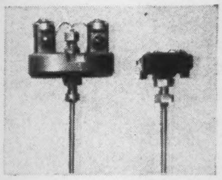
MEGOPAK wire is one of the many special pyrometer supplies available with personalized service from your HSM (Honeywell Supplies Man). For complete details, call the HSM at your nearby Honeywell branch . . . as near as your phone. Or write for Specification S001-4.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Phila. 44, Penna.—in Canada, Toronto 17, Ontario.

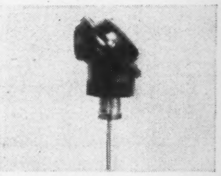
ORDER *MEGOPAK* WIRE OR ASSEMBLIES



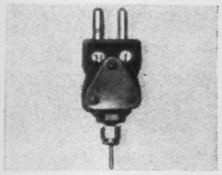
MEGOPAK *wire is available in standard lengths from 6 to 25 feet in 6-inch increments.*



Assemblies with terminal blocks are used for replacement units or where a terminal head can't be supported.



Assembly with terminal blocks and head. It's ready to use, with attachment of extension wires.



Assembly with quick-connect plug that need only be inserted in jack for use.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

First in Controls

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*Trademark Minneapolis-Honeywell Regulator Co.
**Trademark registered, Hoskins Manufacturing Co.

For more information circle **127** on inquiry card.

▶ NEW PLANT

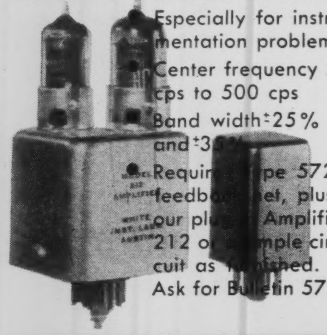
Our new plant at 5500 Balcones Trail, with expanded engineering and production facilities, will allow us to maintain prompt delivery of special networks and filters, in small or large quantities.

▶ MORE PRODUCTION

- RC twin-T networks (Bulletin 500)
- Plug-in feedback nets (Bulletin 572)
- Plug-in amplifiers (Bulletin 212)
- Special LC filters

▶ NEW PRODUCT

BAND PASS AMPLIFIER FILTER



- Especially for instrumentation problems
- Center frequency 2 cps to 500 cps
- Band width ±25% and ±35%
- Requires Type 572 feedback net, plus our plug-in Amplifier 212 or simple circuit as furnished.

Ask for Bulletin 572

▶ NEW ENGINEERING

New Miniaturizations of RC filters and networks.

New active filter networks

AT A NEW ADDRESS

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PO Box 9006
AUSTIN 17, TEXAS

For more information circle **128** on inquiry card.

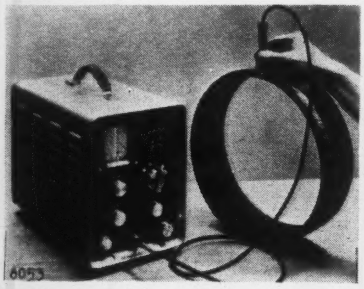
saturation. Energy stored in capacitor bank is discharged through an ignitron in a single unidirectional pulse into a pulse transformer and magnetizing adapter.—*Radio Frequency Laboratories, Inc., Powerville Road, Boonton, N. J.*

For more information circle **379** on inquiry card.

DIMENSIONAL GAGING

ULTRASONIC THICKNESS GAGE

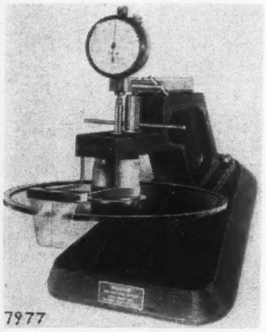
New "SO-100 Sonizon" is said to "reverse present ultrasonic design trends to either big, console-type equipment with visual presentation or to very small portable equipment with audible presentation." It is suitable for heavy-duty production testing; can automatically actuate "go-no go" equipment or alarms.—*Magnaflux Corp., 7300 W. Lawrence Ave., Chicago 31, Ill.*



For more information circle **380** on inquiry card.

DIAL INDICATOR TESTER

New "Master" checks accuracy of all A.G.D. indicators; is said to replace gage-block method; utilizes an 8" calibrated wheel with 0.0001" graduations and a hairline sight. Readings to 0.00002" can be easily estimated.—*Petz-Emery, Inc., Pleasant Valley, N. Y.*

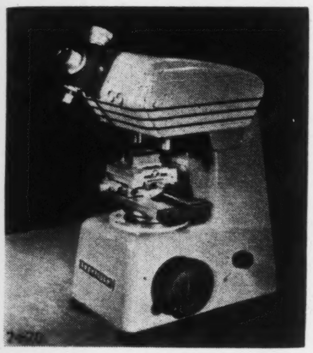


For more information circle **381** on inquiry card.

MECHANICAL TESTING

MICRO-HARDNESS TESTER

New combination micro-hardness tester and metallurgical microscope, of non-destructive type, has load-weight range of 25 to 1000 grams; requires only one minute for a complete test cycle; has interchangeable vise accessories.—*Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.*



For more information circle **382** on inquiry card.

PORTABLE HARDNESS TESTER

Improved portable metal hardness tester provides direct readings in Rockwell "A", "B" or "C" scales or Brinell Medium or Low scales on practically any size, shape or type of metal. Reading can be made in seconds by placing tester on metal, pressing handgrips down and reading dial. Tester comes complete with diamond penetrator and test block in wood case. "Bench Adaptor" is also available for continuous run testing. —*Newage Products, Inc., 222 York St., Jenkintown, Pa.*

For more information circle **383** on inquiry card.

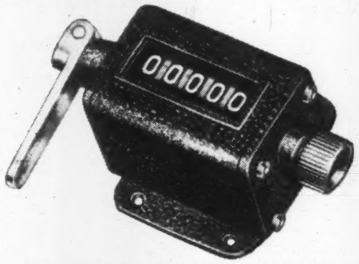
ANGULAR ACCELEROMETER CALIBRATOR

New "Model AA C-2," for calibrating angular accelerometers within range of 0.5 to 140 radians per seconds squared (when typical instruments are mounted on oscillating table), is a torsional pendulum device which operates with low-decrement sinoidal oscillations. Both period and

THE
A B C
OF
1 2 3

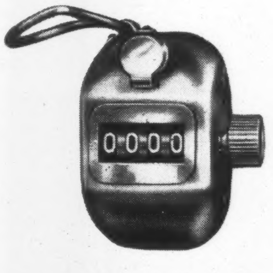
Why is COUNTROL
important in every business today?

Countless times a day, every business needs to know "how many? . . . how much? . . . how far? . . ." and many other questions that can be answered only by facts-in-figures. But how to get these figures . . . from so many different machines, processes, operations and systems? Veeder-Root Counters are doing it every day, by means of:



MECHANICAL COUNTING

Small Resets count strokes, turns, or pieces . . . are used by thousands for moderate duty in parts inspection, quality control, conveyors, machine tools, light presses, etc.

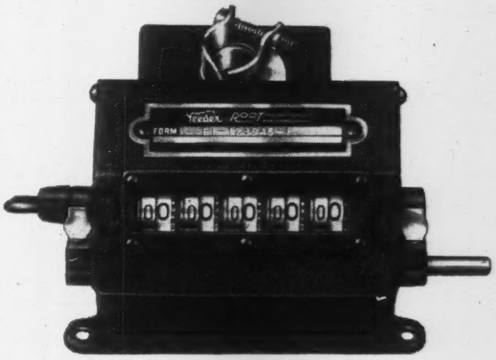


HAND COUNTING

Where objects or units cannot be counted electrically or mechanically, hand-operated counters like this Hand Tally do the job. For instance, quick spot checks of production or performance, traffic count, inventory, etc. Fits palm of hand, counts one for each pressure of thumb lever, resets to zero by turning knob.

ELECTRICAL COUNTING

These remote-indicating counters bring your production machines as close as your office wall. AC or DC, they can be connected in series with any simple switch, and will transmit production figures *instantly* over any distance. May be panel-mounted in groups.



CONTROLLING

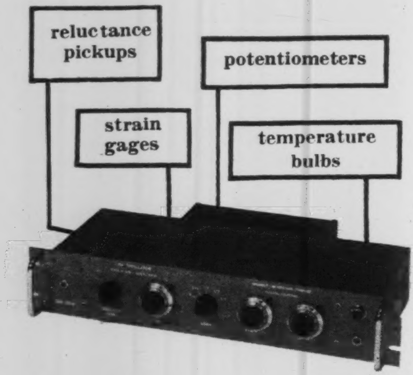
Set it for the exact number of turns, pieces, or operations required . . . and this Predetermining Counter will control the run *exactly* . . . preventing over-runs and shortages. When the predetermined number is reached, counter will light a light, ring a bell, or actuate a stop-motion.

IN SUM: *If it can be counted or controlled . . . count on Veeder-Root to do it. Get in touch with your Industrial Supply Distributor for standard counters for application to your production machines and processes. And get in touch with Veeder-Root for counters to be built into original equipment.* **Veeder-Root Inc., Hartford 2, Connecticut.**

Insist on Standard
VEEDER-ROOT COUNTERS
from your Industrial Supply Distributor
®

For more information circle **129** on inquiry card.

DO YOU HAVE A
PROBLEM
OF CONVERTING
A PARAMETER
TO FREQUENCY



wiancko

frequency modulated OSCILLATORS

These oscillators are designed to accept up to 24 Wiancko-type reluctance pickups, or several strain gages or potentiometers, and afford the maximum in reliability and repeatability. Operating on the phase-shift principle the instruments provide a linear frequency deviation proportional to input with compensation adjustments for non-linear pickups. Models such as the Type 18-1204 below are generally used in systems with bandwidths corresponding to real data. Other models are available using standard RDB bands. Controls on the front panel allow for adjustment of zero input frequency, bandwidth, and linearity. An additional DC analog output is provided so that data can be monitored on a meter, oscilloscope, and/or recording galvanometers.

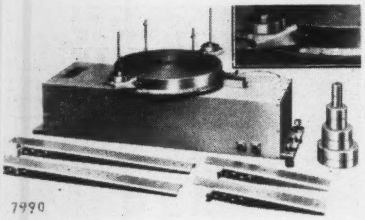
SPECIFICATIONS, SERIES 18-1200

Power	+300 V, DC at 50 ma; —200 V, DC at 45 ma.
Bandwidth	2000 cps (10 KC to 12KC)*
Output	20 volts rms nominal.
Linearity	0.1% or better.
Temp. Range	0° to 160° F.
Zero Drift	Less than 1% of bandwidth for 100° F.

*Other models available with Std. RDB bands.

WIANCKO ENGINEERING CO.
255 NORTH HALSTEAD AVE.
PASADENA, CALIFORNIA

For more information circle **130** on inquiry card.

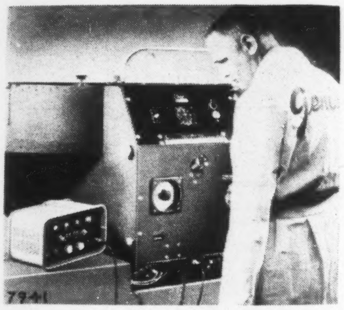


amplitude of oscillation can be set to obtain desired test conditions.—*Statham Development Corp., 12411 W. Olympic Blvd., Los Angeles, 64, Calif.*

For more information circle **384** on inquiry card.

G-ACCELERATOR ACCESSORY

New accessory for accurately determining boom rotation speed of maker's "G-Accelerators, Models B78, C159 and D184," comprises a toothed wheel and a magnetic pickoff which can be directly connected to an electronic counter with a set time base. Toothed wheel is connected to main shaft of "G-Accelerator," produces 600 pulses per revolution.—*Genisco Inc., 2233 Federal Ave., Los Angeles 64, Calif.*



For more information circle **335** on inquiry card.

ELECTRICAL TESTING

TRANSISTOR TESTER

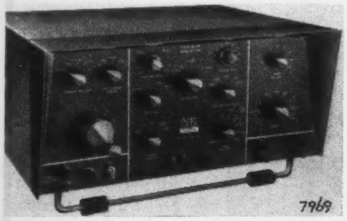
New battery-powered "Model 505," for rapidly and conveniently determining important parameters of *p-n-p* and *n-p-n* small-signal medium-power and switching transistors, permits multiple testing of transistors operating in common-emitter configuration.—*Measurements Corp., Boonton, N. J.*

STANDARD TEST SET
7866

For more information circle **386** on inquiry card.

TRANSISTOR TESTER

New "Model BCT 300 Transistor Curve Tracer" is flexible and permits testing on all types in forward or reverse direction; plots entire family of curves on standard lab dc scope. Both 'scope axes can be accurately calibrated by use of internal standard which supplies a grid.—*Norden-Ketay Corp., 99 Park Ave., New York, N. Y.*



For more information circle **387** on inquiry card.

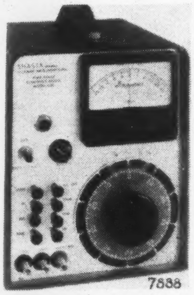
TRANSISTOR OSCILLATOR

STEWART BROTHERS
1000 CYCLE TRANSISTOR OSCILLATOR
7892

New "Model J" 1000-cps transistor oscillator is self-contained and its battery operating life exceeds 700 hr. It provides pure sine-wave output voltages of 0, —13, —16 dbm at 1000 cps into 600-ohm line.—*Stewart Bros. Div., Instrument Labs., 315 W. Walton Pl., Chicago 10, Ill.*

For more information circle **388** on inquiry card.

RESISTANCE BRIDGE

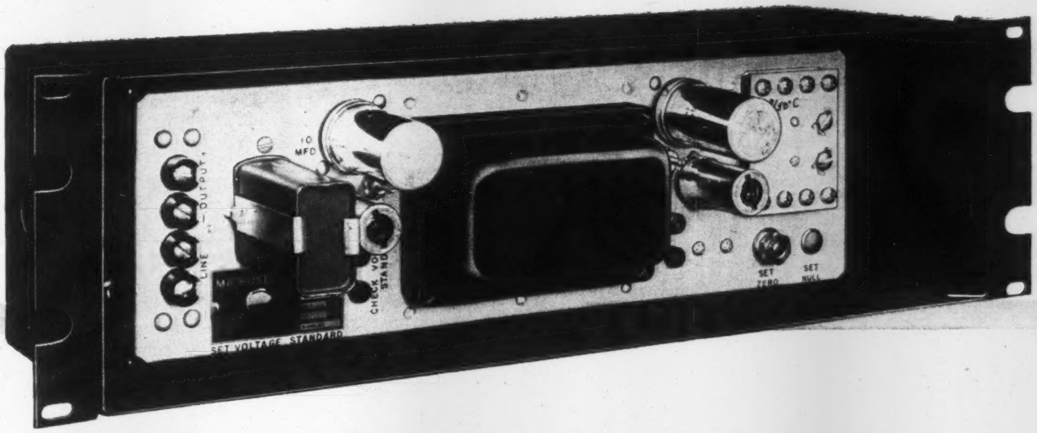


New "Model 605" wide-range direct-reading bridge rapidly and easily checks resistances over seven ranges from 100 ohms to 100 megohms full scale selectable by push button switches. Lowest measurable resistance is 5 ohms.—*Shasta Div., Beckman Instruments, Inc., P. O. Box 296, Station A, Richmond, Calif.*

For more information circle **389** on inquiry card.

SYSTEM TESTER

New "TM-1 Test Meter," for use with maker's "Centralized Operations Control System," permits fast simple testing without need of technically trained personnel. Special clips hold it in place on rack-mounted "COC" equipment. Attachment cable (inte-



NEW TRANSMITTING POTENTIOMETER OFFERS 7 BIG FEATURES

- ★ **Extreme sensitivity. Responds to input change of 3 microvolts or less.**
- ★ **Self-contained continuous voltage reference. No standard cells.**
- ★ **No batteries or periodic standardization. Continuous accuracy without drift.**
- ★ **Simple circuitry. Only 2 single triode tubes.**
- ★ **Interchangeable range card. Ranges easily changed in the field.**
- ★ **No slide wires or choppers. Trouble-free operation.**
- ★ **Fast response: 0.04 second time-constant for 1000° F. span.**

The Series 184 Transmitting Potentiometer is the latest addition to the 'American-Microsen' System of Electronic Transmission and Process Control. With this new unit, it is now possible to measure and control thermocouple temperatures or the signals from such devices as pH amplifiers, gas analyzers, resistance thermometer elements, and other electrical systems.

The extreme sensitivity of the new Potentiometer, plus the high resolution and response speed of the 'American-Microsen' Control System, makes it possible to control process temperatures with the high accuracy required by present-day production demands.

The 0.5 to 5.0 ma. signal output can be transmitted 30 miles or more, over a single 2-wire circuit. In addition to 'American-Microsen' receiver, the signal will operate standard d-c milliammeter indicators and recorders.

OPERATING SPECIFICATIONS

Spans: 6 to 50 millivolts d-c.
Suppression: Up to 5 times span.
Output Signal: 0.5 to 5.0 ma. d-c.
Sensitivity: 0.003 millivolts (0.1° F.).
Repeatability: 0.02 millivolts. (0.6° F.).
Input Source Impedance: 200 ohms maximum.
Effective Input Impedance: 1000 ohms per millivolt of span.
Output Load Impedance: 3000 ohms maximum.
Speed of Response: 0.8 seconds for 99% response on 6 millivolt span. Speed increases with span.

Write today for Bulletin MTT810.

MANNING, MAXWELL & MOORE, INC.

MAXWELL
MANNING M&M & MOORE INC
TRADE MARK

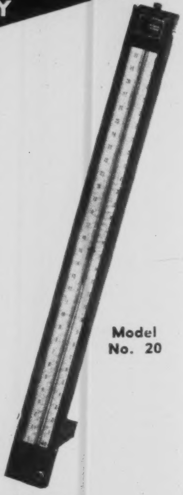
INDUSTRIAL CONTROLS DIVISION, STRATFORD, CONNECTICUT

MAKERS OF THE 'AMERICAN-MICROSEN' TRANSMISSION AND PROCESS CONTROL SYSTEM, 'AMERICAN-MICROSEN' ELECTRO-PNEUMATIC TRANSDUCERS AND ELECTRO-HYDRAULIC CONTROL VALVE OPERATORS.

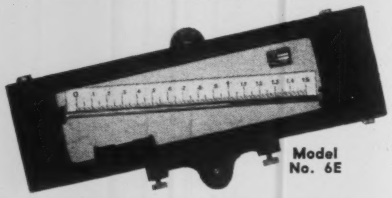
For more information circle **131** on inquiry card.

Trimount
MANOMETERS
- EASY READING
- ACCURATE
- STURDY

WELL TYPE MANOMETERS
- Welded steel channel
- Enclosed plate glass cover
- Red Line Pyrex tube
- Front Zero adjustment

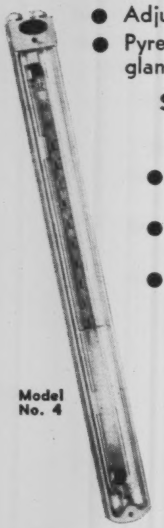


DRAFT GAUGES with Wall Mounting Brackets



- Dust tight glass cover
- Adjustable scale
- Pyrex tube—compression gland packed

SLIDING SCALE U-TUBE MANOMETERS
- Cast aluminum channel
- Heavy Pyrex U tubes
- Leak proof compression type glands



Write for latest bulletin E showing our complete line of Manometers. Contact us for custom made designs to help you solve your problems.

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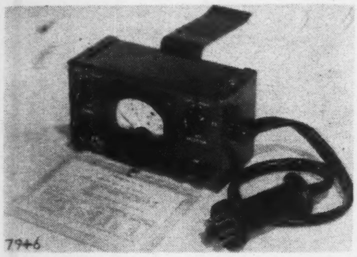
3119 WEST LAKE STREET • CHICAGO 12, ILLINOIS

For more information circle **132** on inquiry card.

NEW INSTRUMENTS

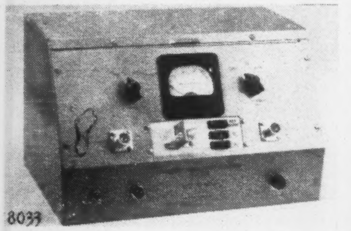


gral part) has plug-in connector that mates with sockets provided in every unit of "COC" equipment. All tests can be conducted without changing test leads or interrupting service.—*Hammarlund Mfg. Co., Inc.*, 460 *W. 34th St., New York* 1, *N. Y.*

For more information circle **390** on inquiry card.

DIODE TESTER

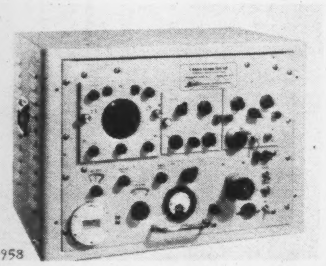
New "Model ND-1 Standard Diode Pulse Recovery Test Set," for measuring the inverse pulse recovery of silicon and germanium diodes, has been accepted as the standard test method of JETEC of RETNA Committee on Solid State Devices. Feature: inherently low load time constant, which allows recovery time of test set itself to be much lower than that of most available diodes.—*Hauman Instruments Company, Inc.*, 70 *Coolidge Hill Road, Watertown* 72, *Mass.*



For more information circle **391** on inquiry card.

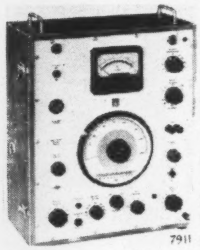
RADAR TEST SET

New Radar Test Set, for complete check-out of radar and other microwave transmitters in field or on production line, is available in C-band, X-band and Ku-band frequencies; includes spectrum analyzer, power monitor, direct-reading frequency meter, signal generators with variable pulse, sawtooth and square-wave modulation.—*Kearfott Co., Inc., Western Div.*, 253 *N. Vinedo Ave., Pasadena, Calif.*



For more information circle **392** on inquiry card.

SIGNAL GENERATOR

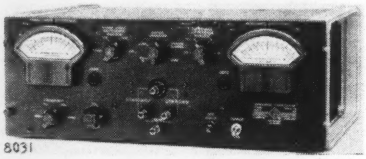


New "Signal Generator and Control System" (mfd by Bruel & Kjaer) is a beat-frequency oscillator designed for a wide range of audiofrequency measurements, with facilities for automatic frequency scanning and chart recording of data as when used with "Brush High Speed Level Recorder Model BL-2304." Logarithmic frequency range, 20 to 20,000 cps, can be swept continuously manually or by external drive. Other unique features include remote control facilities, an output control system to permit external signal feedback, and automatic frequency markers.—*Brush Electronics Co.*, 3405 *Perkins Ave., Cleveland* 14, *Ohio.*

For more information circle **393** on inquiry card.

IMPEDANCE COMPARATOR

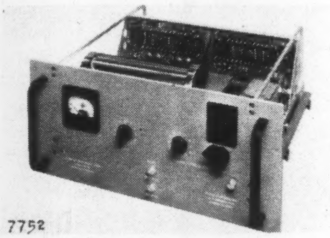
New high-precision "Model 1605-A" facilitates rapid sorting of electrical components; indicates directly the percent difference between two impedances without requiring a bridge balance; can be used to compare complex impedances of any phase angle; also indicates simultaneously the phase-angle difference. On sensitive ranges, differences can be determined to 0.01% and to 0.0001 radian, respectively.—*General Radio Co.*, 275 *Massachusetts Ave., Cambridge* 39, *Mass.*



For more information circle **394** on inquiry card.

1-Mc SIGNAL SOURCE

New "Ultra Stable Oscillator," for use as a secondary frequency standard, etc., delivers 1 Mc tunable over a range of ±0.5 cps, with drift less than 1 part in 10^9 per day after one month's operation. Crystal oven temperature stabilized to better than 0.01 C°. Outputs: sine wave 4 v rms; pulse 1 v; output impedance about 250 ohms.—*Hycon Eastern, Inc.*, 75 *Cambridge Parkway, Cambridge* 42, *Mass.*

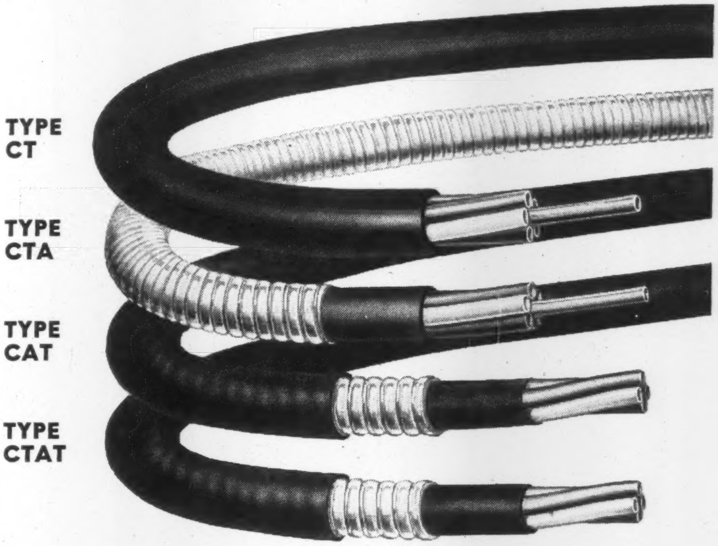


For more information circle **395** on inquiry card.

The Answer To Your Corrosion Problems

CRESCENT ARMORED MULTITUBE

FOUR CORROSION-RESISTANT TYPES



TYPE CT—In damp or corrosive locations where a moderate degree of mechanical protection to the tubes is required, as in troughs or attached to sheltered building surfaces as supporting means, the first construction illustrated is recommended. It employs a tough, corrosion-resistant polyvinyl chloride thermoplastic sheath, resistant to water, acids, alkalies, oils and most chemicals, applied over CABLED copper* tubes. The sheath will not support combustion.

TYPE CTA—gives corrosion protection to the tube, and the galvanized steel armor protects the tubes and polyvinyl thermoplastic sheath from mechanical injury during and after installation. Recommended for direct burial in concrete or pulling into underground conduits.

TYPE CAT—gives corrosion protection to the galvanized steel armor as well as the tubing. Recommended where the polyvinyl thermoplastic sheath will not be subject to mechanical injury.

TYPE CTAT—Combining the advantages of Types CTA and CAT, the fourth type illustrated has the polyvinyl chloride thermoplastic sheath both under the armor and over the armor, thus providing maximum mechanical and corrosion protection.

**All these corrosion-resistant types can be furnished with other types of tubing, and up to 19 tubes.*

Plastic Coated Single Tubes, copper or aluminum should be used to give corrosion protection to all single lines up to the final tube fitting where trouble from corrosion may occur. Available as *CRESCENT Single tube* Type CT.

Send for Bulletin 356-A giving complete information and engineering data

CRESCENT INSULATED WIRE & CABLE CO.

TRENTON, NEW JERSEY

For more information circle **133** on inquiry card.

PRODUCTION ENGINEERS

JOIN THE LEADER IN AERO CONTROLS!

Honeywell needs top-notch Process Engineers at all levels of responsibility for directing the production of such *airborne* control systems as:

- INERTIAL GUIDANCE
- INLET AREA CONTROL
- JET ENGINE CONTROL
- FIRE CONTROL AND BOMBING
- FLIGHT CONTROL SYSTEMS
- FUEL MEASUREMENT AND MANAGEMENT
- EXHAUST GAS TEMPERATURE INDICATION

Engineers selected will analyze designs, establish process methods and control, and guide designs toward economical and speedy production.

■ To qualify, you should be familiar with process evaluation, cost estimating, tool ordering, metals fabrication, and manufacturing-assembly operations. Your background should be in the area of *precision* electrical, mechanical, or hydraulic devices such as gyros, accelerometers, operational computers, pressure switches, amplifiers, calibrators, altitude compensators, and thermistor level switches.

■ These are permanent, career-building positions that Honeywell can offer because of its succession of achievements in airborne control systems, broad diversification, and healthy balance between civilian and military contracts.

CONSIDER THESE ADVANTAGES

■ Minneapolis offers you metropolitan living with a suburban way of life . . . A city of beautiful lakes with every recreational facility a few minutes from your home.

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■ Honeywell, the nation's leading supplier of control systems, manufactures over 10,000 diversified products. A sound growth company, Honeywell offers continuing expansion and permanent opportunities for you to advance.

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If you are interested in a career at Honeywell, call collect or send your résumé to Bruce Wood, Technical Director, Dept. T-9, Aeronautical Division, 1433 Stinson Boulevard, N.E., Minneapolis 13.

MINNEAPOLIS
Honeywell
AERONAUTICAL DIVISION

ELECTRICAL and ELECTRONIC INSTRUMENTS

DIGITAL DC RATIOMETER

New "R 105" measures ratio of two dc voltages, E_1 and E_2, where E_1 is derived from E_2 and E_2 drives both

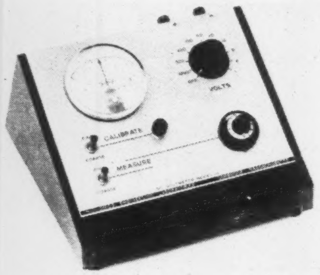
DC
DIGITAL RATIOMETER
7928

ratiometer bridge and test unit. Range 00.000 - 99.999; maximal resolution 1 part in 100,000; average reading time 1 second. Optional: remote read-out and printer operation.—*Electro Instruments, Inc., 3794 Rosecrans St., San Diego, Calif.*

For more information circle **396** on inquiry card.

POTENTIOMETER

New "Model VI" features accuracy better than 0.5%, simplicity and low cost; has ten overlapping ranges from

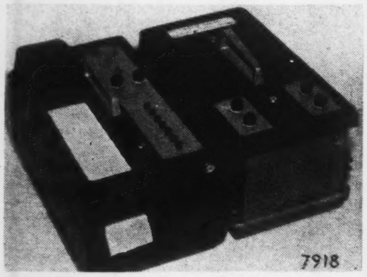


1 to 1000 v; is designed to fill gap between high-precision lab potentiometers and low-precision instruments; uses null-balance potentiometric method, 1½-v dry cell, and built-in standard cell for reference. *Nuclonics Engineering Labs., Inc., 32 Monadnock Rd., Wellesley Hills 81, Mass.*

For more information circle **397** on inquiry card.

TWO-CHANNEL OSCILLOGRAPH

New "Type 5-301 Datagraph" and "Type 1-133" amplifier constitute a two-channel direct-writing oscillograph which instantaneously records frequencies as high as 250 cps at 1" double amplitude; is said to have "greater flexibility than any direct-writer on the market today"; can record voltages from practically any source. Rectilinear record can be seen immediately. Six chart speeds; automatic time pulses; manual "event marker."—*Consolidated Electrodynamics Corp., 300 N. Sierra Madre Villa, Pasadena, Calif.*



For more information circle **398** on inquiry card.

EDGEWISE MICROAMMETER

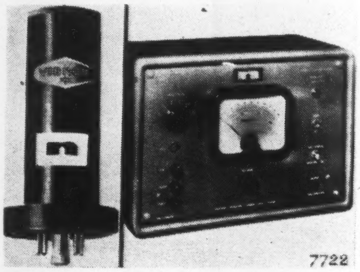
New "Model 700" edgewise indicating instrument features full-scale sensitivity of ½ microampere, believed to be unique in electrical measurements field; is the first of a series for voltage, current and resistance measurements, all with bifilar suspension movement which minimizes friction losses and prevents external-stress damage.—*Greibach Instruments Corp., Metuchen, N. J.*

MICROAMPERES
7945

For more information circle **399** on inquiry card.

ELECTROMETER SYSTEM

New "Vibron Electrometer" for measuring ionization currents, infrared signals, etc., is an ultrahigh-impedance plug-in dc/ac mechanical converter. Extreme stability is assured by sealing gold-plated electrodes in a gas-filled metal envelope. ★ Matching "Type 33B" dc amplifier, with input impedance of 10^{13} ohms, has six ranges covering 10 to 1,000 mv with a stability of better than 0.1 mv over a 12-hour period.—*Central Electronics Mfrs., Inc., Sub. Nuclear Corp. of America, Inc., Suite 4219, Empire State Building, New York 1, N. Y.*



For more information circle **400** on inquiry card.

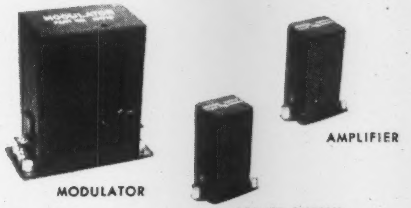
MICROVOLT-AMMETER

New "Model 203R" ultrasensitive rack-mountable dc microvolt-ammeter and amplifier permits accurate measurements from 10 uua to 100 ma and from 10 uv to 1000 v; can also be used

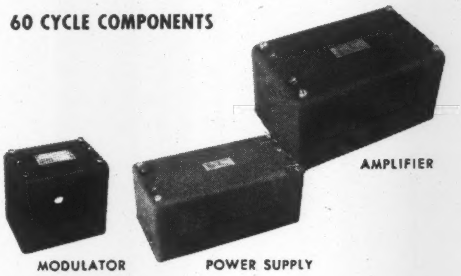
SAVE VALUABLE DESIGN TIME
in both development and production by using SERVOMECHANISMS' proven components.

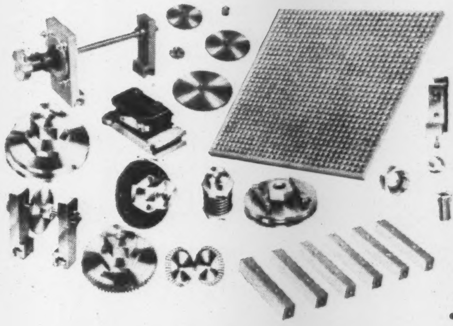
INSTRUMENT MOTORS

400 CYCLE COMPONENTS



60 CYCLE COMPONENTS





MECHANICAL DEVELOPMENT APPARATUS

These proven components *are available now.* We've designed them—allowing you to concentrate your time on the application. The 60 and 400 cycle components, together with the companion instrument motors and the extensive line of Mechanical Development Apparatus, offer the Design Engineer an assortment of ready-made units that are ideally suited for closed loop control applications.

These packaged function components are plug-in units permitting quick and easy replacement *anywhere.*

Servomechanisms, Inc. manufactures these units for use in its own analog computers and control systems. *Now,* they are available as individual units. All of the components meet applicable military specifications for both prototype and production deliveries.

The design philosophy of packaged functions; the years of manufacturing experience, and the constant improvement of the basic units, all add up to optimum adaptability, performance and reliability.

Find out more about these quality units and how they can Save You Design Time. Write today for complete technical information.

SERVOmechanisms
INC.

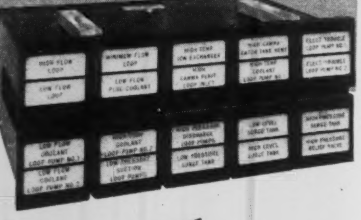
EA-356

MECHATROL DIVISION, 625 Main Street, Westbury, L. I., New York

For more information circle **134** on inquiry card.

Never Before

Such A Versatile, Low Cost ALARM SYSTEM!



SCAM DU-ALL

(Patent 2,730,704)

Scam Model SC-10 DU-ALL annunciator systems introduce new standards for compactness, usefulness and economy. Available in four standard cabinet sizes with Scam's unique plug-in relays, plug-in light boxes with 2-section back lighted nameplates. Each plug-in and light box combination provides alarm indication for two separate and unrelated field conditions . . . Write or phone for information on your specific alarm problem.

ALARM SEQUENCE:

Normal: lights off, horn off
Abnormal: lights flashing, horn on
Reset: lights bright, horn off
Normal again: lights off, horn off

Features of the SC-10 MODEL

1. **Interchangeable with standard Scam systems.**
2. **Operates with normally open field signals.**
3. **Optional Lock-in of momentary alarms.**
4. **De-energized circuit (no-drain).**
5. **Photograph illustration above with 20 alarm stations requires panel area of only 7⅝" high x 17⅜" wide.**
6. **Two lamps for each indication.**
7. **Economical.**

THE SCAM INSTRUMENT CORP.

Chicago 18, Illinois
Phone IRving 8-9334

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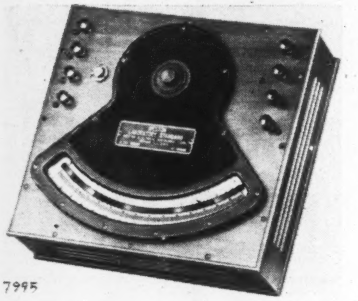
For more information circle **135** on inquiry card.

as a low-drift dc amplifier with 80 db gain and high input impedance. Circuit: input divider followed by a chopper amplifier and a two-stage direct-coupled meter-driver amplifier. High input impedance and stability assured by unique feedback arrangement which provides up to 84 db of over-all feedback. New instrument is useful as a recorder driver where recorder does not have required high input impedance or sensitivity.—*Kay Lab, 5725 Kearney Villa Road, San Diego 11, Calif.*

For more information circle **401** on inquiry card.

SELF-SHIELDED STANDARD



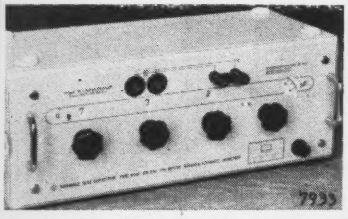
New "Model 325 D-C Laboratory Standard" replaces "Model 5"; is claimed to have a far greater degree of shielding than any previous instrument in 0.1% accuracy class: no measurable error in a 5-oersted field; no need to position instrument with relation to earth's magnetic field, nor to take special precautions in presence of current-carrying conductors.—*Weston Electrical Instrument Corp., Newark 5, N. J.*

For more information circle **402** on inquiry card.

ELECTRICAL-INSTRUMENT ACCESSORIES

STANDARD CAPACITOR

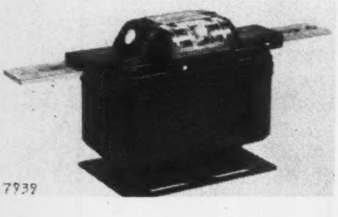
New "Type FT-KGM" precision decade three-terminal standard capacitor, whose accuracy of 0.2% is said to exceed by far that of previously available commercial test capacitors, can serve as a lab standard, for calibration, for various circuit measurements, etc. Its three terminals permit it to be used as a grounded or ungrounded component. Owing to its high resonant frequency (about 0.35 to 11 Mc) it is useful over a wide frequency range. Total capacitance range extends from 100 uuf to 1.11 uf. Settings are made on three decade scales and one continuously-variable air capacitor scale.—*Federal Telephone & Radio Co., Instrument Div., 100 Kingsland Rd., Clifton, N. J.*



For more information circle **403** on inquiry card.

CURRENT TRANSFORMER

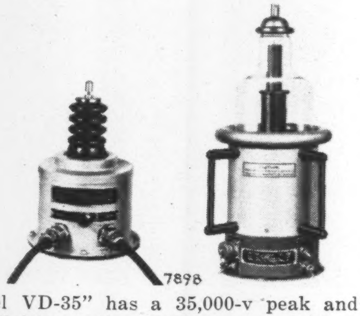
New "JKM-4" butyl-molded 8700-v indoor current transformer for operating instruments, meters, relays, and control devices, is available in all standard single-primary current ratings from 10 to 800 amp and all ratings have a single 5-amp secondary. Frequency rating 25- to 60-cps. Meter accuracy is ASA Class 0.3 with burdens B-0.1 to B-2.0. ASA relay accuracy class is 2.5H100 at 60 cycles.—*General Electric Co., Schenectady 5, N. Y.*



For more information circle **404** on inquiry card.

HV CAPACITANCE DIVIDERS

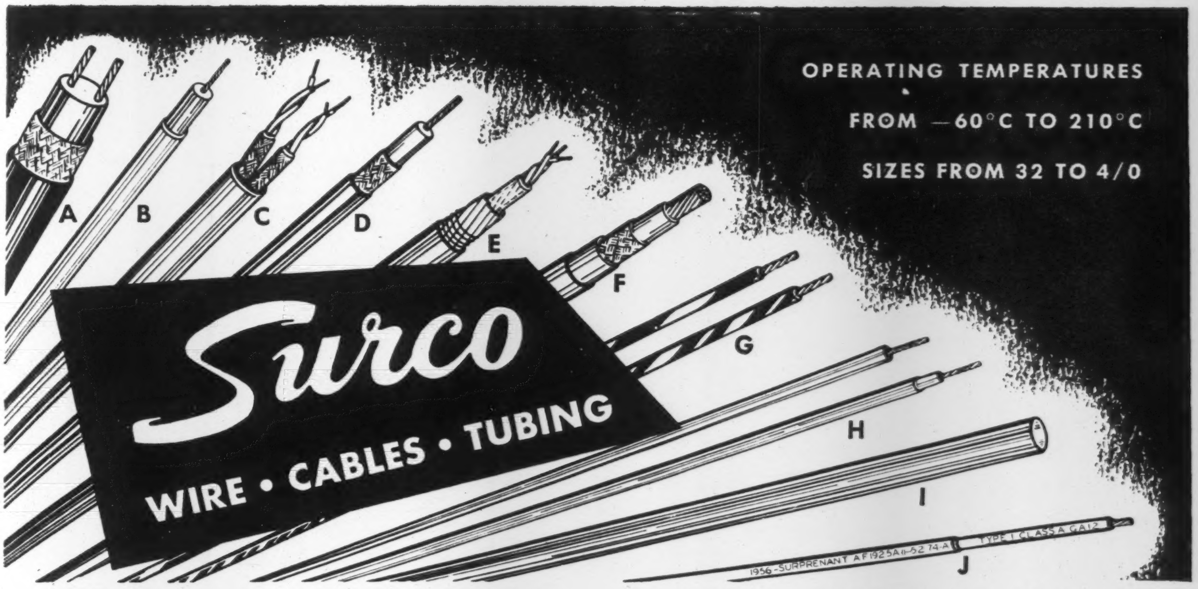
Two new high-voltage capacitance voltage dividers can be used with almost any synchroscope or CRO. "Model VD-35" has a 35,000-v peak and division ratios of 200 to 1 and 50 to 1. "Model VD-100" incorporates a vacuum capacitor, is highly stable, has extremely wide voltage range (250 to 100,000 peak) and division ratios of 500 to 1, 100 to 1, and 10 to 1.—Manufactured by Press Wireless Laboratories, Inc., and distributed by *Vectron, Inc., 1571 Trapelo Road, Waltham 54, Mass.*



For more information circle **405** on inquiry card.

CUSTOMIZED TRANSFORMERS

New line of customized small transformers features universal-type mounting, low-cost reliable terminal construction, aluminum casing; rub-



A **Coaxial Cables** — "Surco" coaxial cables include a wide variety of types, such as low capacity, extra flexibility, small diameter, microphone 2 conductor, and high temperature "Teflon". Conform to Military Spec. MIL-C-17B. Many special designs. If you have a coaxial cable problem consult us.

B **"Miniature Coaxial Cables** — Extruded low-loss Teflon dielectric O. D. under 1/16 inch for 50 ohm cable and under 1/8 inch for 95 ohm cable. Low capacitance, stable electrical characteristics."

C **Miniature Wire and Cable** — "Surco" miniature wire and cables are made in conductor sizes down to No. 32 AWG in stranded and No. 30 AWG in solid. Close control in manufacturing permits small finished diameters on both single and multi-conductor cable. Available in standard colors with and without nylon jackets or shielding in the various vinyl or polyethylene compounds.

D **"Surflene" Insulated Hook-up Wire and Tubing** — "Surflene", extruded monochlorotrifluroethylene, has excellent resistance to heat, abrasion and most chemicals, including nitric acid. Having high dielectric strength and insulation resistance, it is especially useful in totally enclosed applications with continuous temperatures up to 135°C. "Surflene" is available in 15 solid colors and wall thickness down to 0.008". Also available in limited range of sizes in transparent or colored tubing.

E **Multi-Conductor Cables** — "Surprenant" Multi-conductor cables are available with conductor sizes from No. 32 AWG and larger with vinyl, "Surflene", or Teflon insulation, with or without nylon jacket or shielding and can be made to specification for special design and applications. Close tolerances permit unusually small overall diameters and "Spiralon" color coding permits easy identification even when hundreds of conductors are involved.

F **New Improved Aircraft Wire** — Surprenant new lightweight, smaller diameter MD wire (vinyl, glass braid, nylon) and the standard Surprenant sandwich construction (Vinyl, glass braid, nylon) give excellent overload safety, high and low temperature performance, good electrical properties and have a nylon jacket giving greater resistance to abrasion, fungus, moisture, hydraulic and other oils (nylon braided jacket on size 10 AWG and larger for greater flexibility) and are made to conform to MIL-W-5086. "Surprenant" also offers nylon jacketed polyvinylchloride construction made to conform to Military Spec. MIL-W-5086, MIL-C-7078, and MIL-W-7072.

G **"Spiralon"** — "Surco-Spiralon" color coding is available on all vinyl, nylon, Teflon, and Kel-f insulated wires, with or without nylon jackets. One, two or three color stripes are available in the Nema colors providing almost unlimited color identifications. Solid color insulation is also available in the 10 standard Nema colors.

H **"Surco" A-10 for (105°C) Hook-up Wire** — A-10 is an unusually high grade vinyl insulating compound developed in our own laboratories for a better hook-up wire. It has excellent resistance to deformation, soldering, high temperature, low temperature and aging; high electrical properties; Underwriters Lab. approved for continuous operation to 105°C without fibrous covering. A-10 insulated wire made to conform to MIL-W-16878B, Types B, C, and D, with or without nylon jackets or synthetic braids.

I **"Surco" Tubing** — "Surco" vinyl, nylon, polyethylene, silicone rubber, Kel-f and Teflon tubing available in a wide variety of sizes, temperature ranges, electrical and physical characteristics.

J **MIL-W-5274A Radar & Electronic Hook-up Wire** — Made to conform to Air Forces Spec., this wire offers excellent low temperature performance. Nylon jacketed, is has high abrasion resistance and superior surface resistivity even under adverse humidity conditions, making it very adaptable for high impedance circuits.

Silicone Rubber Wire and Cable — Thin wall silicone wire for 600 and 1000 volt service up to 400°F continuously and higher with short life ratings. Remains flexible at—100°F. Braided and jacketed constructions available for increased mechanical and abrasive characteristics.

Extruded THIN WALL *Teflon* INSULATED (210°C) HOOK-UP WIRE

Continuously operable over the range from —90°C to 210°C without appreciable deterioration, extruded "Teflon" (polytetrafluoroethylene) is now available in walls as thin as 0.010" (type WTE) and 0.015" (type RTE). Teflon combines non-flammability, chemical and solvent resistance, high volume and surface resistivity with extremely low electrical losses. This wire is available in all flexible strandings from AWG 8 and conforms to performance requirements of MIL-W-16878B. Colors and Spiralon markings conform to MIL-STD-104. Also, available in limited range of sizes in natural or colored tubing.

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MFG. CO.

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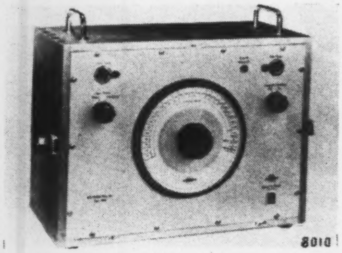
ber-covered leads; and multi-range regulator design ballast with primary voltages from 100 to 520.—*Outdoor Lighting Dep't, General Electric Co., Hendersonville, N. C.*

For more information circle **406** on inquiry card.

FILTER SET

New "Model BL-1609 One-Third Octave Filter Set" (mfd by Bruel & Kjaer) designed for sound and vibration measurements and, in general, any audio signal analysis or telemetry data reduction, comprises 27 flat-topped filters of 1/3 octave band pass width with seven additional filters available as optional equipment to cover 14-36,000 cps spectrum; also standardized weighting networks and a linear band pass.—*Brush Electronics Co.,* 3405 *Perkins Ave., Cleveland* 14, *Ohio.*


8010

For more information circle **407** on inquiry card.

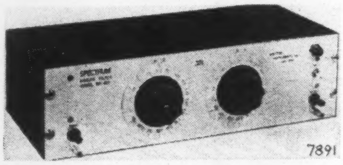
FLAT-FACE 'SCOPE TUBE

New "1EP1" flat-face oscilloscope tube, 1¼" diameter, is intended primarily for use in light-weight portable equipment or in continuous monitoring service for large equipment. Useful screen diameter 1$\frac{1}{16}$"; over-all length 4$\frac{1}{16}$"; weight 2 oz; medium-persistence P1 Phosphor.—*Radio Corp. of America,* 30 *Rockefeller Plaza, New York* 20, *N. Y.*

For more information circle **408** on inquiry card.

ANALOG FILTERS

New series of analog filters for sharp bandpass performance at audio and subsonic frequencies is announced.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"Model BP-160" features independent control of HF and LF band limits; cut-off at rate of 166 db per octave in each case; voltage-frequency characteristic an exact analog of a multi-section passive *LC* filter. Analog achieved without inductances, hence no conventional LF design limitations. —*Spectrum Instruments, Inc.,* 44-05 *30th Ave., Long Island City, N. Y.*

For more information circle **409** on inquiry card.

POWER SUPPLIES, AMPLIFIERS, etc.

OSCILLOGRAPH SUPPLY

New "Type 3-131" dc power supply, designed for oscillograph operation but usable in many other applications, provides 23.5 to 28.5 vdc at 16 amp max.—*Consolidated Electrodynamics Corp.,* 300 *North Sierra Madre Villa, Pasadena, Calif.*

7822

For more information circle **410** on inquiry card.

FAST-RESPONSE DC SUPPLY

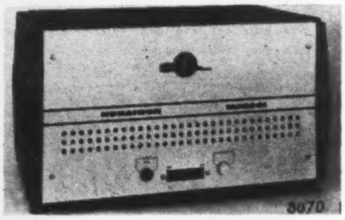
New "Model 3-1.5 MB" is a 1½-amp unit featuring fast recovery time: 0.4 millisecond no-load to full load and 0.25 ms FL to NL, enabling use with computers and quick-response lab and industrial applications. It delivers 0 to 300 vdc continuously variable without switching; variable bias voltage of 0-145/155 @ 5 ma., and 6.3 vac @ 10 amp.—*Dressen-Barnes Corp.,* 250 *N. Vinedo Ave., Pasadena, Calif.*

8020

For more information circle **411** on inquiry card.

TUBELESS DC SUPPLY

New "Model MA 6501" delivers 6 vdc and 2 vdc (40, 60 and 100 ma loads) regulated to within 0.01% and also 6 vdc (5% adjustable) for a 5-amp load; features a rugged-construction transistorized circuit combining reliability and precise performance. A silicon diode is used as reference element, and a temperature-compensated transistor amplifier provides control current for magnetic ampli-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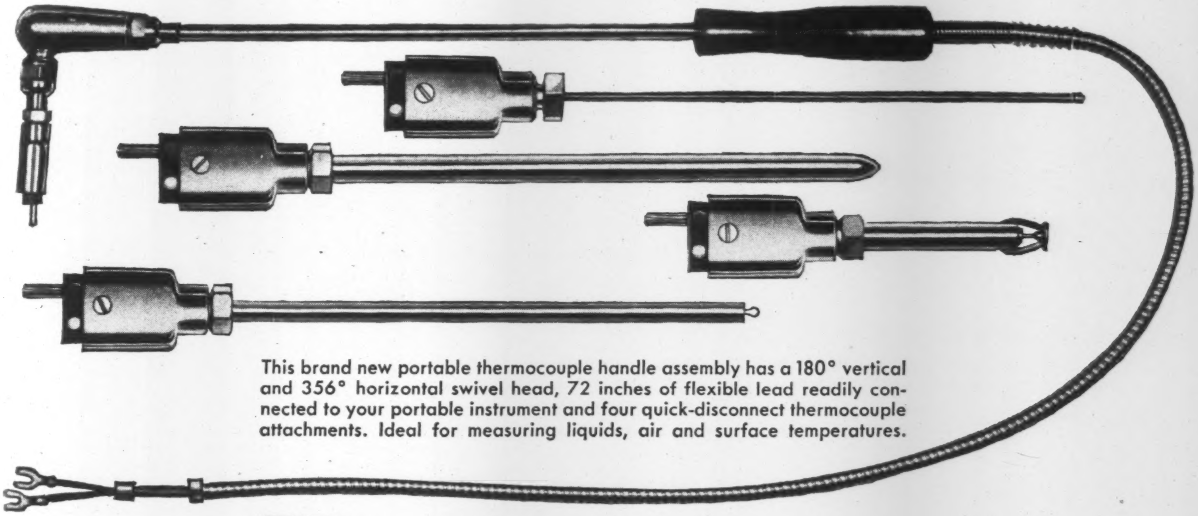
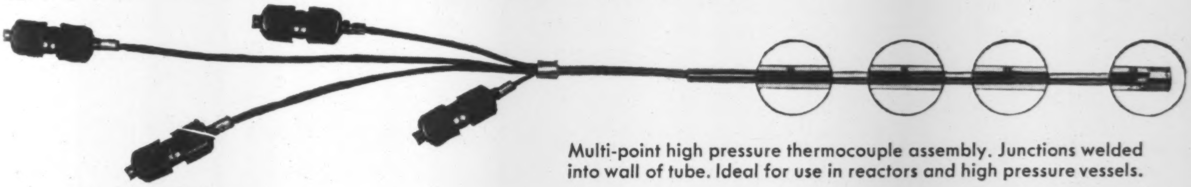
Here are just a few of the many new types of thermocouple assemblies that are shown and described in detail in our new catalog. All are ingeniously designed in miniature sizes for your greater convenience . . . engineered for greater adaptability. All are available in Iron-Constantan, Copper-Constantan, and Chromel-Alumel. Send for complete catalog!



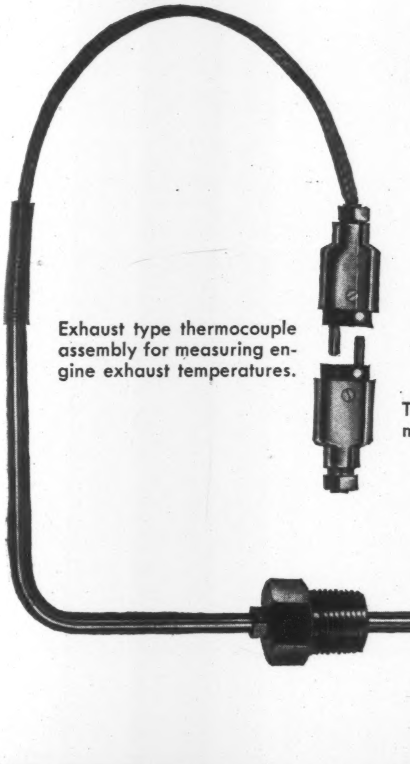
This brand new portable thermocouple handle assembly has a 180° vertical and 356° horizontal swivel head, 72 inches of flexible lead readily connected to your portable instrument and four quick-disconnect thermocouple attachments. Ideal for measuring liquids, air and surface temperatures.



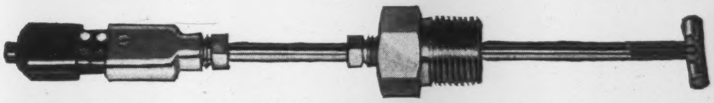
Multi-point high pressure thermocouple assembly. Junctions welded into wall of tube. Ideal for use in reactors and high pressure vessels.

Immersion type thermocouple assembly for measuring liquid temperatures.

Bolt type thermocouple assembly. Exposed junction for fast response. Best for measuring bearing and block temperatures.



Exhaust type thermocouple assembly for measuring engine exhaust temperatures.



The new shielded thermocouple assembly with a quick-disconnect connector mounted rigidly to the tube. Designed for measuring gas flow temperatures.

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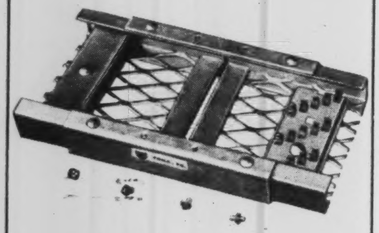
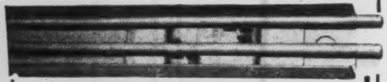
for Supporting Instrument Tubing

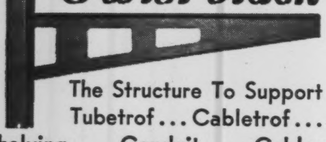


P-W Manufactures a complete trough system with channel connectors. Drive rivets are used for quick assembly.—Extension Connectors eliminate field cutting—Adjustable connectors for any change in direction or elevation—I Section for long spans—Tube Clips—Cushion Clamps



Raceway to support a limited number of tubes with connectors, elbows, tees, etc.—Bulkhead Bar. P-W systems are available in widths from 1" to 24" and in lengths from 1' to 16'.

Twist-Rack



The Structure To Support Tubetrof ... Cabletrof ... Shelving ... Conduit ... Cables ... Pipe, Etc.

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For more information circle 138 on inquiry card.

fier. Typical stability after a 30-minute warm-up is 0.01% for an 8-hr period.—*Sorensen & Co. Inc., Fairfield Ave., Stamford, Conn.*

For more information circle **412** on inquiry card.

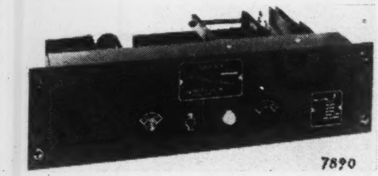
REGULATED POWER SUPPLIES

New "Z-95000 Series" power supplies are unique in plug-in circuit design with no components mounted under chassis. Output voltage variable from 175 to 250 vdc at 200 ma (either plus or minus can be grounded). Regulation better than 1% from 0 to 130% of rated load. Total ripple and noise less than 7.2 mv rms. Available: filament voltage 6.3v 8 amp, and 0-150-v bias supply. Bench and rack-mounted models available. One rack-mounted model has an integral blank chassis for building counters, timers, divider systems, pulse generators, etc. with maker's plug-ins.—*Eeco Production Co., 506 E. First St., Santa Ana, Calif.*

For more information circle **413** on inquiry card.

REGULATED DC SUPPLY

New improved "Model MA65A" tubeless regulated dc source, utilizing magnetic amplifier circuitry, is recommended for unattended installations. Input range 105-125 vac, 1 phase, 60 cycle; output voltage 5.4 to 6.6 vdc, adjustable; load range 0-5 amp; ripple 1% maximum; regulation accuracy 0.2% against line or load (1/10 to full); recovery time 0.15 sec.—*Sorensen & Company, Inc., Fairfield Avenue, Stamford, Conn.*



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For more information circle **414** on inquiry card.

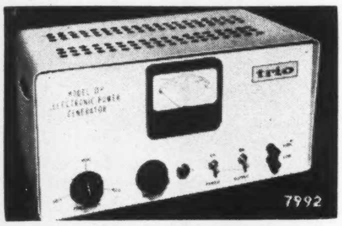
POWER SUPPLY AND DEMODULATOR UNIT

New "Model DV-1 Regulated Power Supply—Demodulator Unit," for use with gyros in flight test applications where 115-v 400-cps single-phase primary power is available, weighs 13 lb; has been designed for use with 1 to 3 Doelcam "Model K Rate Measuring Gyroscopes" to comprise a complete rate measuring system. It energizes motor and pickoff of each gyro and converts ac outputs to dc for oscillograph galvanometers. —*Doelcam Div. Minneapolis-Honeywell, 1400 Soldiers Field Road, Boston 35, Mass.*

For more information circle **415** on inquiry card.

ELECTRONIC POWER SUPPLIES

New "Model DP Electronic Power Generators" deliver up to 100 va of low-distortion power. Four standard models (400, 1000, 1600, and 2000 cps) are available in two versions: single, factory-set frequency, or variable frequency, panel-controlled over a range of ±5% of nominal. Any non-standard output frequency can be specified, and tuning fork-stabilized instruments similarly can be tailored.—*Trio Laboratories, Inc., 4025 Merrick Road, Seaford, N. Y.*



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For more information circle **416** on inquiry card.

SUBMINIATURE DC SUPPLIES

New subminiature highly-regulated dc power supplies, in many sizes and ratings from 5 v for strain gages to

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Openings for engineers and specialists familiar with in-plant cable testing and inspection, instrument and test apparatus checking and calibration; also in-plant audits of inspection, quality control, and specification compliance procedures.
Please send resume' of education and experience, stating age and salary requirements, to

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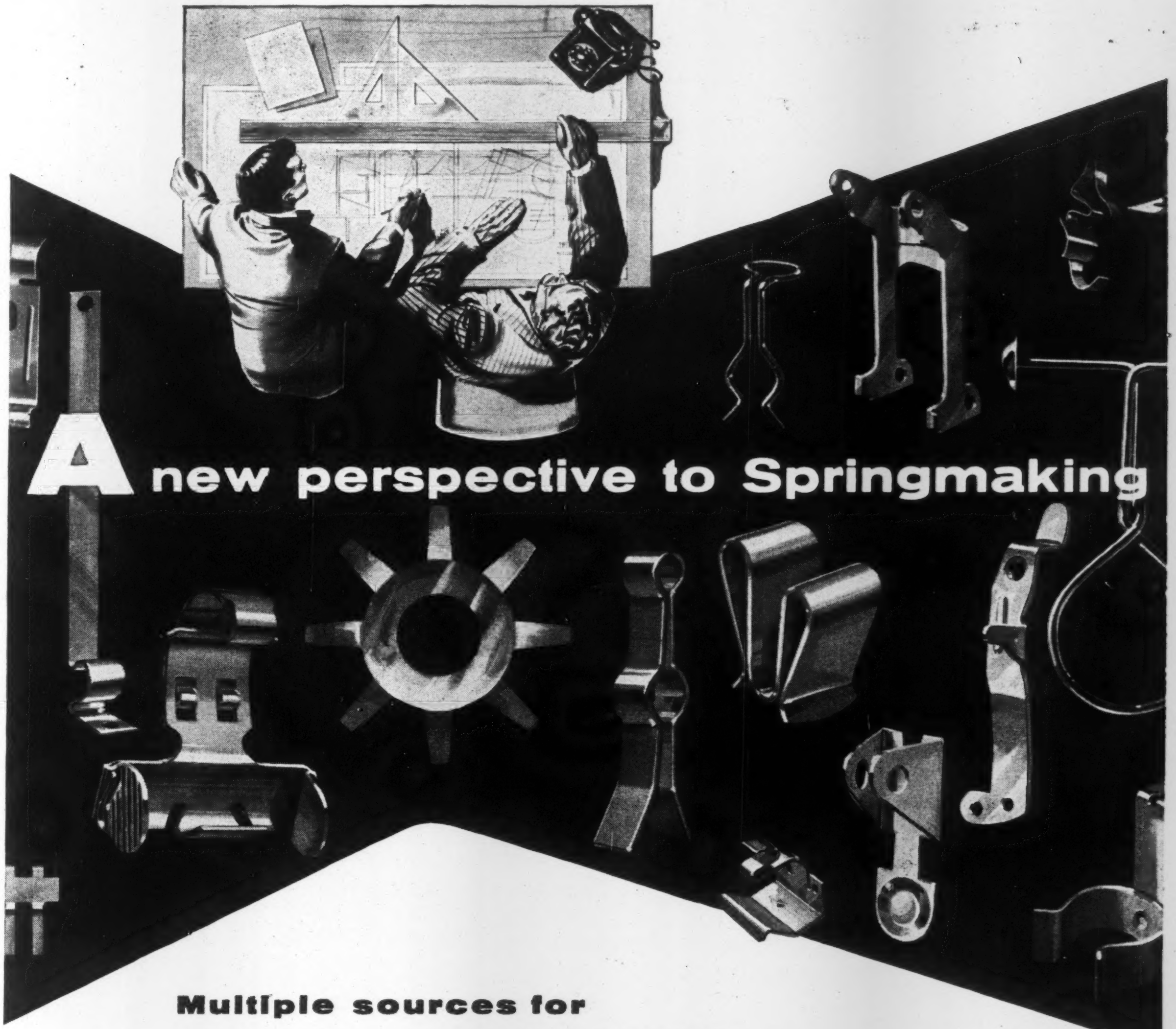

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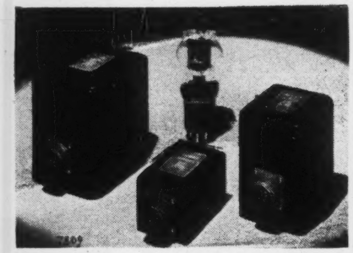
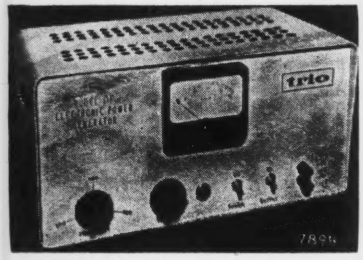


550 v for regulated plate voltage, contain no vacuum tubes or transistors but are of magnetic-amplifier type.—*Arnoux Corp., Dept. IR-5, Box 34628, Los Angeles, Calif.*

For more information circle **417** on inquiry card.

FREQUENCY SUPPLIES

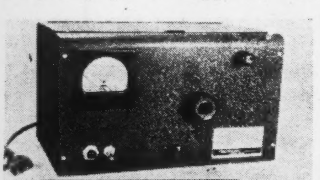
New "Model DP Metered Electronic Power Generators" deliver up to 100 va of low-distortion power at any fixed frequency between 50 and 5000 cps. Four standard models (400 cps, 1000 cps, 1600 cps, and 2000 cps) are available in two versions: single factory-set frequency, or variable frequency panel-controlled over a range of ±5% of nominal.—*Trio Laboratories, Inc., 4025 Merrick Road, Seaford, N. Y.*



For more information circle **418** on inquiry card.

HV RF POWER SUPPLIES

Two new models are added to maker's line of low-cost high-voltage radiofrequency power supplies. "Model 15BR" delivers 2-15 kvdc with 1 ma @ 10 kv; "Model 30BR" delivers 5-30 kvdc with 1 ma @ 20 kv. Both have regulation of better than 1%.—*Neutronic Associates, 87-16 116th St., Richmond Hill 18, N. Y.*



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DRIFT FREE
DC μV
AMPLIFIER

KAY LAB
MODEL 111

The **KAY LAB MODEL 111** amplifier provides the lowest drift of any commercially available broadband d-c amplifier. The unique circuit incorporates **KAY LAB's** proven chopper amplifier system to provide unsurpassed dynamic performance — unaffected by load or gain changes. Available in a single-unit cabinet or a six-amplifier rack-mountable module only 19 inches wide, the **Model 111** is ideal for data reduction facilities, or as a strain gage amplifier, recorder driver amplifier, or general purpose laboratory amplifier.

SPECIFICATIONS

- ± 2 uv equivalent input drift
- Integral power supply
- ± 35V, ± 40 ma output
- 100,000 Ω input impedance
- 0 to 1000 gain in ten steps
- ± 1% gain accuracy
- 5 uv peak equivalent input noise
- Price (Single) Amplifier $550.00

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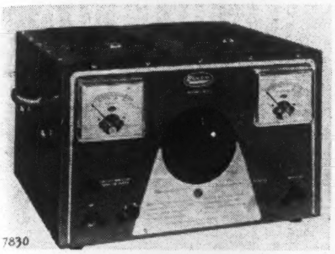
For more information circle **141** on inquiry card.

DC POWER SUPPLY

New "Model NFA" features less than ¾% ripple at top load of 15 amp; continuously variable voltages from 0 to 32 and versatility to test almost all electronic equipment. A unique application is said to increase selenium rectifiers' power rating and to provide "lower cost per ampere output."—*Electro Products Labs., 4500 N. Ravenswood Ave., Chicago 40, Ill.*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DC AMPLIFIER

ON
OVERLOAD
BALANCE
KAY LAB
SAN DIEGO • CALIFORNIA
70
100
200
50
300
30
500
20
700
0
GAIN
1000

New "Model 111" chopper stabilized broadband dc amplifier features ten feedback-controlled gain ranges from 20 to 1000; gain accuracy 1%; 2-uv drift said to be "the lowest drift of any commercially available broadband dc amplifier." Input impedance 100,000 ohms; output impedance less than 1 ohm; frequency response ±0.3 db to 10 kc and less than 3 db down at 40 kc; equivalent input noise less than 5 uv peak-to-peak from 0 to 3 cps and less than 12 uv rms from 0 to 50 kc. Integral power supply. Amplifier output capability is ± 35 volts or ± 40 ma.—*Kay Lab, 5725 Kearney Villa Rd, San Diego 11, Calif.*

For more information circle **421** on inquiry card.

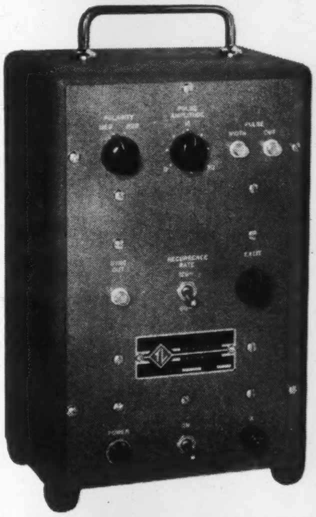
DC SIGNAL AMPLIFIER

New the "Micromag MMO-422" low-level magnetic dc signal amplifier, for telemetering and instrumentation applications, utilizes a transistor oscillator to operate directly from a dc power source so that gain is free from variations normally en-

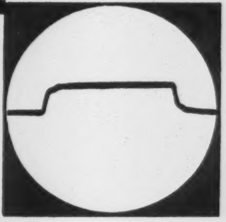
7861

MILLI-MICROSECOND PULSE GENERATOR

- Practically ideal rectangular pulses at recurrence rates of 60 or 120 pulses per second
- Rise and decay times down to 1.2 mμs, minimum width 1.2 mμs, maximum duration unlimited
- Amplitude 0 to 35 volts with 93 ohms load, may be adjusted using standard DC voltmeter
- Sync output signal isolated from the main output with provisions for delaying the main pulse
- Time parameters determined by standard RG-62/μ coaxial cable or accessory width and delay unit



ACTUAL PHOTO
50 mμs PULSE



MODEL PG-215 PULSE GENERATOR $245.
MODEL PGA-220
WIDTH & DELAY UNIT (optional) $195.00

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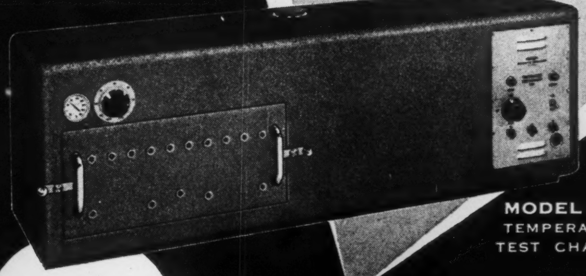
Temperature
Test Chamber

For ambient temperature tests in the LABORATORY or on the PRODUCTION LINE, the Model TC-2 Temperature Test Chamber is ideal. Interchangeable extra test trays may be ordered to eliminate loading delays in continuous production tests, or for convenience in special test work.

Range: —65° to + 350° F.
Heater: Electric strip heater
Coolant: Dry ice, 15 lbs. capacity
Control: Adjustable thermostat & selectable heat inputs
Load Capacity: 600 cubic inches of test materials
Power: 115V, 5 amp. 50-60 cycle
Overall Size: 48" x 16½" x 12"
Weight: 62½ lbs.



MODEL TC-2
TEMPERATURE
TEST CHAMBER

$550.00
F.O.B. LOS ANGELES

STATHAM
DEVELOPMENT
CORPORATION
12411 W. Olympic Blvd.
Los Angeles 64, Calif.

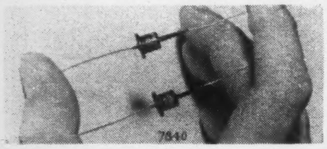
For more information circle 143 on inquiry card.

countered when excitation is provided by a 400-cps line supply subject to a ± 10% tolerance. It provides ripple-free 5 vdc output from 1-mvdc signal input. All-magnetic construction assures stability under the most severe operating conditions.—*Magnetic Research Corp., 200-202 Center St., ElSegundo, Calif.*

For more information circle **422** on inquiry card.

HI-TEMP SILICON RECTIFIERS

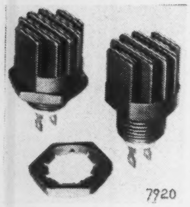
New "1N537 and 1N538" silicon rectifiers have rated maximum dc output current of 250 ma at 150°C (up to 750 ma where lower temperatures are encountered). "1N537" maximum peak inverse voltage is 100; "1N538" PIV is 200 v. Maximum surge current for both is 10 amp.—*Semiconductor Products, General Electric Co., Electronics Park, Syracuse, N. Y.*



For more information circle **423** on inquiry card.

ELECTRICAL COMPONENTS

MINIATURE POWER RESISTOR

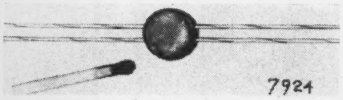


New "Dalohm PH-25 Powerhouse" 25-watt resistor features a unique finned design of heat-dissipating housing. New single-hole panel mounting simplifies design where space is limited. Average weight of complete unit is 15 grams. Standard resistance values from 0.1 ohm to 15,000 ohms with tolerances from 0.05% to 5.0%.—*Dale Products, Inc., Columbus, Neb.*

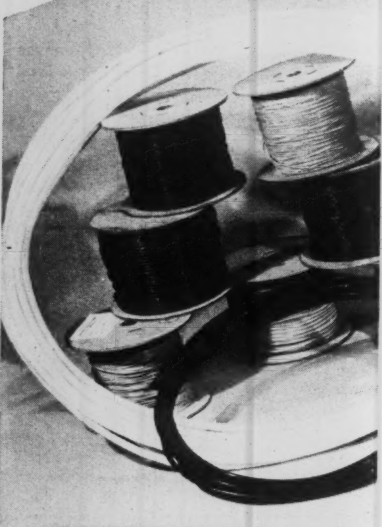
For more information circle **424** on inquiry card

SUBMINIATURE VDRs

New encapsulated "Disk Resistors" can replace two or more precision resistors employed as voltage dividers. Matched ratios over wide temperature ranges are possible with resistance wire matched to within 5 ppm/C°. Units withstand high humidity and temperatures to 125°C.—*Eastern Precision Resistor Corp., 675 Barbey St., Brooklyn, N. Y.*



For more information circle **425** on inquiry card.



PF
SPAGHETTI TUBING
MADE FROM
TEFLON*

For SLIP-ON INSULATION
BUNDLE SHEATHING
BUSHING INSULATION
BARRIER INSULATORS, PIGTAILS

And Similar Applications Where Only PF TEFLON Can Do The Job*

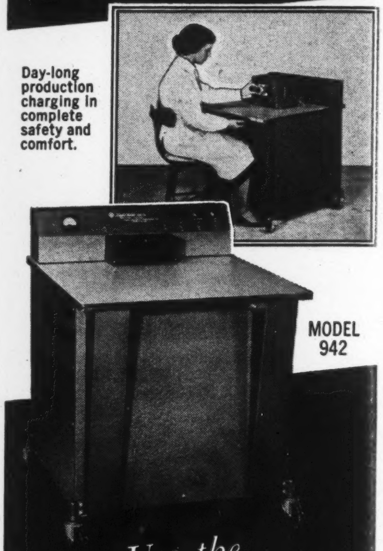
ADVANTAGES . . .
- good dielectric strength (500 to 1000 volts/mil)
- lowest dielectric constant (2.0) and dissipation factor (0.0002) of any solid dielectric
- no change of electrical properties with temperature (-25°C to +250°C) or frequency (60 cycles to 100 mc).
- zero moisture absorption
- unaffected by any commercial chemical

PF spaghetti tubing is stress relieved for minimum shrinkage and carefully inspected and controlled dimensionally. A full range of sizes and colors are available to meet your specific needs. Write, wire or call for further information, competent engineering assistance and information on special sizes and walls. PF flexible tubing, heavy-walled tubing and rod stock made from Teflon* is also available.

PENNSYLVANIA FLUOROCARBON CO., INC.
1115 N. 38th Street, Philadelphia 4, Pa.
EVergreen 6-7680

*"Teflon"—DuPont trade name for Tetrafluoroethylene resin

For more information circle 144 on inquiry card.



How to Charge HIGH-FLUX Magnets

Day-long production charging in complete safety and comfort.

MODEL 942

Use the MODEL 942 Magnet Charger

RECOMMENDED BY LEADING MAGNET MAKERS

This high powered condenser discharge unit will saturate large Alnico and ceramic permanent magnets of any shape, using interchangeable, plug-in pulse transformers or wire-wound fixtures. 100,000 ampere-turn output of basic unit can be increased to 200,000 ampere-turns at any time by adding 100 µf condenser banks and appropriate pulse transformer. Adapters for multi-pole rotors, rod, bar, ring and various other shapes are available.

Operates from regular 115 volt, 60-cycle line with only intermittent 10-ampere drain (the few seconds when condensers are charging). Mounted on casters for convenient mobility. Price of basic unit with pulse transformer is less than $2,000.

WE CAN HELP YOU
Our 12 years of magnet charging experience is yours for the asking — send a sample magnet or sketch for free charging analysis.

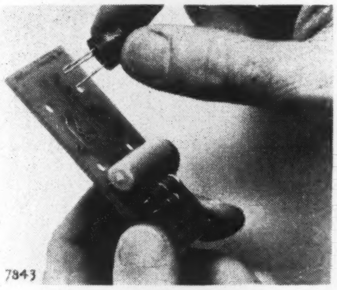
Write for Technical and Application Data.

Radio Frequency
LABORATORIES, INC.
Boonton, New Jersey, U. S. A.

For more information circle 145 on inquiry card.

DIRECT-MOUNTING VDR

New "PC-5" wire-wound voltage-dividing resistor mounts directly on graphic-circuit boards without screws and lugs; is easily adaptable to automatic installation techniques.—*George-Held, Inc., 1020 North La Brea, Los Angeles 38, Calif.*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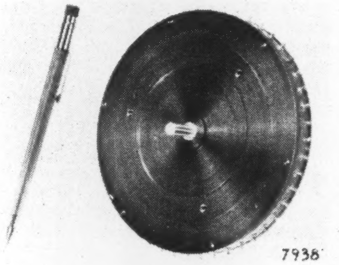
For more information circle **426** on inquiry card.

MULTI-TAP PRECISION VDR

New 48-tap version of "RL-270A-5 Precision Potentiometer" gives 47 equal resistance sections, while maintaining guaranteed linearity of 0.1%. Total resistance of 500,000 ohms affords a resolution of 0.0075% (13,000 turns).—*The Gamewell Co., Newton Upper Falls 64, Mass.*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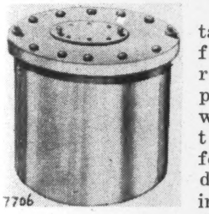
For more information circle **427** on inquiry card.

LOW-INDUCTANCE CAPACITORS

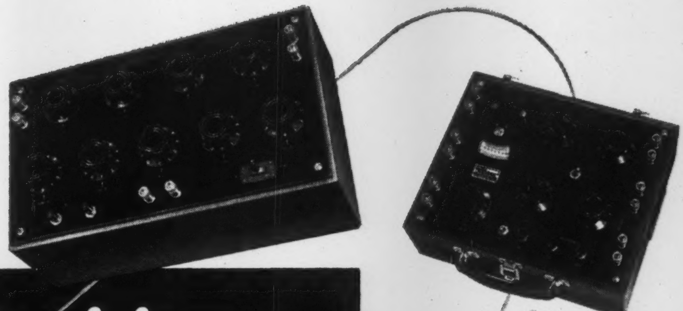

7706

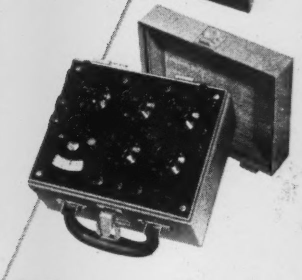
New low-inductance capacitors, for applications requiring high peak energy within a short time constant, feature a unique design which minimizes magnetic flux; are hermetically-sealed. Stock ratings available from 500 joules @ 25 kv with 0.025 uh inductance to 8000 joules @ 125 kv with 0.065 uh inductance. (Others to order.)—*Axel Bros., Inc., 134-20 Jamaica Ave., Jamaica 18, N. Y.*

For more information circle **428** on inquiry card.

ULTRA LOW-LOSS QUARTZ TRIMMER CAPACITOR

New "Model VC11A Fused Quartz Piston Capacitor," for use in capacitor networks requiring low-loss and





Precision WHEATSTONE BRIDGES

Highest Accuracy. . . Minimum Size for Field, Lab, and Production Use

There's a Shallcross Bridge for measuring resistance to any desired precision—indoors or out. Field models have aluminum cases with controls easily adjustable even with a gloved hand. Models for lab, production, and school use feature high readability and simple operation—even for unskilled users.

Accuracy, Stability, and Ruggedness—unsurpassed in any instrument of comparable price.

Selections from the complete Shallcross line are described below. Additional specifications on these, and many other types, are available from SHALLCROSS MFG. CO., 510 Pusey Ave., Collingdale, Pa.

Deliveries ✓ from Stock ✓

WHEATSTONE—FAULT LOCATION BRIDGE No. 6100: 5-dial field model. Locates grounds, crosses, opens, and shorts by Murray, Varley, Hilborn, or Fisher Loop and Capacitance tests. Range: 1 to 1,011,000 ohms. Accuracy: ± 0.1%, + 0.01 ohm. 8⅞" x 7⅜" x 5¾". 8 lbs. *Price: $175.*

KELVIN-WHEATSTONE BRIDGE No. 638-R: Shallcross has pioneered this compact combination of two bridges in one. Range: 0.001 to 11,110,000 ohms. Accuracy: ± 0.3% − 1 to 111,100 ohms. 12½" x 10½" x 6¾". 9 lbs. *Price: $260.*

WHEATSTONE-LIMIT BRIDGE No. 6320: Combines 5-dial Wheatstone and Percent-Limit features. Range: 0.1 to 111,110,000 ohms. Accuracy—*Ratio resistors:* ±.01%, *Rheostat:* ± (.01% to .05% + .005 ohms). 15¾" x 9¼" x 5½". 15 lbs. *Price: $700.*

Shallcross

For more information circle **146** on inquiry card.

direct
measurements
on TRANSISTORS!

. . . using MEASUREMENTS'
STANDARD TEST SET
for Transistors
Model 505

STANDARD TEST SET
MEASUREMENTS CORPORATION

- Provides rapid "go-no go" transistor testing — important for quality control, production, engineering groups.
- Useful for comparison of incoming or untested transistors with a reference transistor which meets device specifications.
- Extremely flexible — utility and type of measurement can be established by use of auxiliary equipment — makes all measurements.
- "h" or "r" parameters are measured by connecting external test equipment to applicable jacks and terminals on front panel.

Measurements' Model 505 Standard Test Set for Transistors is a self-contained, battery-powered instrument designed for rapid d-c measurement of important junction transistor parameters. Permits multiple testing of PNP and NPN small-signal, medium-power, and switching (computer) transistors.

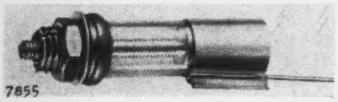
SPECIFICATIONS

DIRECT MEASUREMENTS: Makes fundamental d-c measurements on small-signal, medium-power, and switching transistors operating in the common-emitter configuration.
Measures collector-to-emitter leakage current from 0 to 10 ma; measures collector current from 0 to 10 ma.
Measures direct current gain (d-c Beta) or "incremental current gain" from 0 to 200, or as calibrated. Indicates G_m from 0 to 0.39 mhos.
AUXILIARY MEASUREMENTS: External test equipment can be used for dynamic measurement of "h" or "r" parameters and switching transistor characteristics up to the megacycle region for selected values of operating biases.
POWER SUPPLY: Collector supply voltages of 6 and 12 volts from internal batteries, or from suitable external power supply.

Laboratory Standards
MEASUREMENTS CORPORATION
BOONTON • NEW JERSEY

For more information circle **147** on inquiry card.

NEW INSTRUMENTS



high leakage resistance for 400-cps operation, is also recommended for ultra-stable oscillator circuits and as a tuning element in high-frequency low-power tank circuits.—*JFD Mfg. Co., Inc.,* 6101—16*th Ave., Brooklyn* 4, *N. Y.*

For more information circle **429** on inquiry card.

ELECTRONIC COMPONENTS

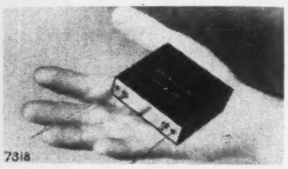
PHOTOTRANSISTOR

New "Type GT-66" miniature germanium *p-n-p* alloyed junction three-lead phototransistor, for use in circuits employing ac amplification for modulated light, can also be used as a two-lead device with unmodulated light; responds to visible and infrared (to 2.1 microns). Photosensitive area is a "point" (1 mm² average area).—*General Transistor Corp.,* 130-11 90*th Ave., Richmond Hill* 18, *N. Y.*

For more information circle **430** on inquiry card.

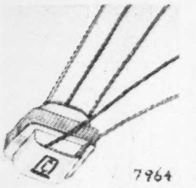
SUBMINIATURE FILTERS

New subminiature (2½" long) filters designed for IF amplifiers for printed circuit use are temperature compensated to 0.15% from—55°C to 85°C.—*Burnell & Co., Inc.,* 45 *Warburton Ave., Yonkers* 2, *N. Y.*



For more information circle **431** on inquiry card.

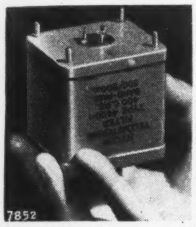
TRANSISTOR TRANSFORMERS



New ultra-miniature push-pull transistor transformers, available for immediate delivery, measure ⅜" x ⅜" x 11/32"; weigh 0.005 lb; have 4" color coded leads suitable for use in dip-soldered printed circuits. Also available for single-ended and vacuum-tube applications.—*Microtran Co., Inc.,* 145 *E. Mineola Ave., Valley Stream, N. Y.*

For more information circle **432** on inquiry card.

TELEMETERING FILTERS

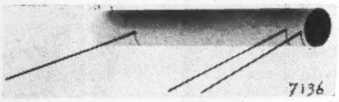


New line of miniature telemetering filters is said to be complete. Photo shows typical miniature band-pass filter in MIL style GB case. It has 15% bandwidth at ±1 db and phase shift linearity within 5%. Attenuation at 15% from center frequency is 30 db.—*Hycor, Div. International Resistance Co.,* 12970 *Bradley Avenue, Sylmar, Calif.*

For more information circle **433** on inquiry card.

LONG-DELAY NETWORKS

New custom-designed long-delay high-impedance distributed-constant delay networks are constructed with radial leads for graphic-board wiring; can be supplied to meet low-cost commercial requirements or military specs. Commercial units can be provided in hermetically-sealed cases, and with terminals arranged exactly for printed circuit boards.—*ESC Corp.,* 534 *Bergen Blvd., Palisades Park, N. J.*



For more information circle **434** on inquiry card.

BALZERS Thin Film Optics

From the Principality of Leichtenstein Swiss Customs Area

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ARCADIA
(Calif.)

Front Surface Mirrors, Cold Mirrors, Achromatic Beam Splitters, Dichroic Beam Splitters, Monochromatic Interference Filters, Wedge Interference Filters, Heat-Reflecting Interference Filters, Cut-Off Filters, Anti-Reflection Coatings, Heat Protective Coatings and many other thin layers.

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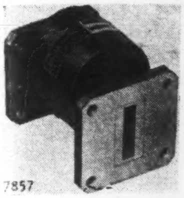
Balzers means research in high vacuum process

For more information circle **148** on inquiry card.

FERRITE ISOLATORS



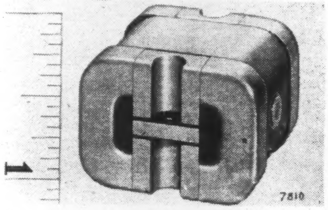
New ferrite isolators utilize a new field displacement resonance absorbtion technique with ferrite material acting as a resonant dielectric waveguide. Db ratios of isolation to insertion loss as high as 500 to 1 have been recorded. New isolators are custom-designed. Illustrated is "Model 165-1A" for 8800 Mc, 50 watts average power, 25 db isolation and 0.25 insertion loss, or a db ratio of 100 to 1.—*Kearfott Company, Inc. (Western Div.) 253 Vinedo Ave., Pasadena, Calif.*

For more information circle **435** on inquiry card.

ELECTROMECHANICAL COMPONENTS

SHORT-STROKE MOTOR

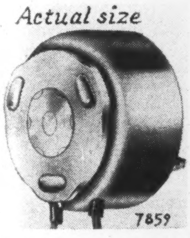
New "Model 24 Torque Motor" weighs 11½ oz; has output conservatively rated at 8 lb of force for 3 watts of input power; is designed to drive hydraulic servovalves, etc. Stroke is ±0.01" and is proportional to input differential current.—*Raymond Atchley, Inc., 2340 Sawtelle Blvd, Los Angeles 64, Calif.*



For more information circle **436** on inquiry card.

ROTARY SOLENOID

New "Model BD1E" 1"-dia rotary solenoid, smallest of maker's eight basic sizes, weighs 1½ oz, has a starting torque of 0.2 lb-in based on ampere-turns for normally intermittent duty cycle and rotary stroke of 45°. Standard rotary strokes are 25°, 35° and 45° clockwise or counterclockwise. Most features available on other seven models can be had.—*G. H. Leland, Inc., 123 Webster St., Dayton, Ohio.*



For more information circle **437** on inquiry card.

P-M GEARHEAD MOTORS

New "BYLM" permanent-magnet type motors have gearheads with maximum torque output of 5 to 10

HEART of your miniaturization program

the EAD 1" MOTOR

Here is EAD's outstanding contribution to the miniaturization program . . . a one-inch diameter, 400 cycle precision motor, engineered for long life and high efficiency. Where minimum size and weight are essential, use this versatile unit. Modifications include high ambient and high altitude versions as well as low voltage designs.

MINIATURE TUBE AXIAL BLOWERS
For efficient cooling and air change in small electronic equipment. Driven by EAD's 1" dia. motor. No brushes, no arcing, no interference.

SUBMINIATURE CENTRIFUGAL BLOWERS
For spot cooling. Moves 9 CFM at 1.35 S.P. Powered by EAD's 1" dia. motor.

MINIATURE RING MOUNTED FANS
For peak performance, compactness, dependability. Blade dia. small as 2" — air del. greater than many heavier blowers. Uses EAD's 1" dia. motor.

MINIATURE GEAR MOTORS
Servo, synchronous or induction units, primarily for 400 cycle and var. freq. operation. Gear ratios up to 10,000 to 1. Basic types use EAD's 1" dia. motor.

MINIATURE SINE WAVE ALTERNATORS
For very pure sine wave voltage, high power output. Low distortion, light weight, permanent magnet fields. Frame sizes begin with 1" diameters.

Complete specifications available on request.

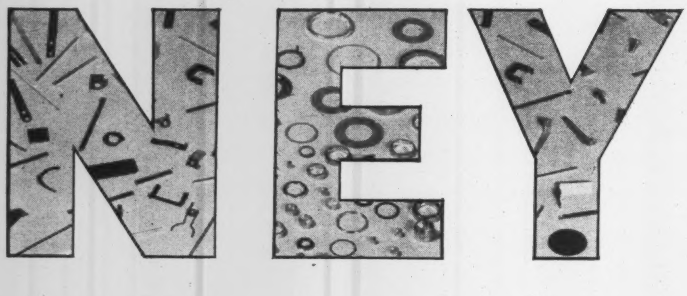
EASTERN AIR DEVICES, INC.
SOLVING SPECIAL PROBLEMS IS ROUTINE AT EAD
347 Central Ave., Dover, New Hampshire

For more information circle **149** on inquiry card.

NEY'S SMALL PARTS PLAY A BIG PART IN PRECISION INSTRUMENTS • NEY'S SMALL PARTS PLAY A BIG PART IN PRECISION INSTRUMENTS • NEY'S SMALL PARTS PLAY A BIG PART IN

ENGINEERED CONTACTS, SLIP RINGS & ALLOYS

Supplied To Your Specifications By . . .



Ney offers wide experience in the development of sliding contacts, slip rings and assemblies, commutator segments and assemblies, brush and brush holder assemblies, and precious metal resistance wire. Call or write the Ney Engineering Department for consultation on any problem involving the use of precious metals to improve your products.

THE J. M. NEY COMPANY, P.O. BOX 990, DEPT. F, HARTFORD 1, CONN.

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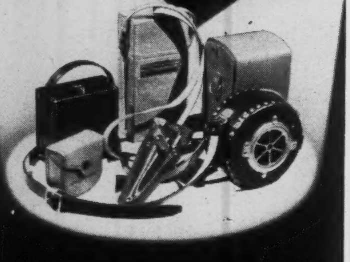
A CASE FOR YOUR PRODUCT . . .

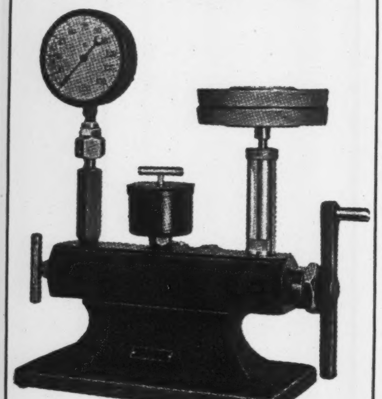


Protect your product.
Stimulate its sale.
Use Leather Cases by . . .

GRATON & KNIGHT Company
WORCESTER, MASSACHUSETTS

For more information circle **151** on inquiry card.

AMTHOR Dead Weight Pressure Gauge TESTER

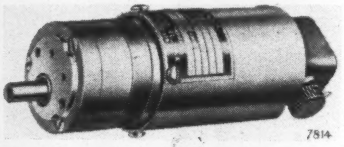


Designed for simplicity and compactness, this tester incorporates the newest refinements and improvements and is praised by users in all industries for long lasting troublefree service. Made in ranges up to 10,000 P.S.I. We guarantee accuracy of 1/10 of 1%. Supplied in metal carrying case with adapters and tools. Weights in special metal container for storing.

Immediate attention will be given to inquiries on your testing problems.
Ask for literature.

Amthor Testing Instrument Co., Inc.
45 Van Sinderen Ave., Brooklyn, N. Y.

For more information circle **152** on inquiry card.

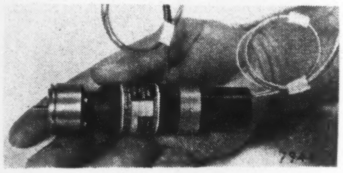


lb-in (shown) and up to 500 lb-in (not-shown); outputs up to 1/10 hp; speeds from 5000 to 20000 rpm less gearhead. Gear ratios for illustrated unit are available from 9.5 to 55,-466/1.—*Aircraft Controls Div., Barber-Colman Co., 1400 Rock St., Rockford, Ill.*

For more information circle **438** on inquiry card

MOTOR-TAC GENERATOR

New synchronous motor and tachometer generator combines maker's "Type MC" motor, "SC" two-phase generator and a special 3:1 spur gear reducer; operates on 115 vac, single phase, 400 cps. Two-phase sine-wave output 20 volts/rpm per phase at 200 cps; harmonic content normally less than 5%.—*Globe Industries, Inc., 1784 Stanley Ave., Dayton 4, Ohio.*



For more information circle **439** on inquiry card.

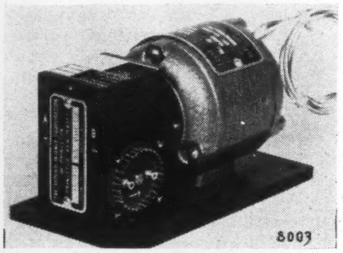
SILICONE INSULATED WIRE

New silicone rubber insulated wire, designed for high-temperature resistance (up to 500°), is said to be "ideal for small conductors in many electronic applications."—*Continental Wire Corp., Wallingford, Conn.*

For more information circle **440** on inquiry card.

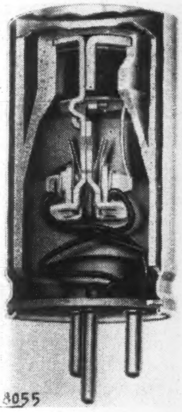
SAMPLING SWITCH

New "Type AA" multichannel sampling switch for telemetering, display systems, programming, etc., features 2 poles with 24, 30 or 32 contacts per pole and sampling rates up to 6 rps. Special construction allows manual phasing of both poles through 360°. —*Applied Science Corp. of Princeton, P.O. Box 44, Princeton, N. J.*



For more information circle **441** on inquiry card.

BUTTONLESS VIBRATOR



8055

New "Series 1600" represents a completely new design: instead of conventional contact buttons, it utilizes vibrating reed and side arms themselves as contacting elements by designing these parts of special contact alloy, whence "far greater contact area, and from 50 to 100% longer vibrator life in service."—*P. R. Mallory & Co. Inc., Indianapolis 6, Indiana.*

For more information circle **442** on inquiry card.

COLLECT FITTING KNOB

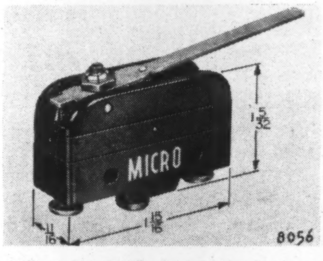
7919

New "Type MK-2" military style knob for flatted shafts incorporates "Dalohm" positive locking collet which prevents inoperativeness due to loosening on shaft. Material is a tough thermosetting plastic. Wide choice of skirts, dial plates and pointers.—*Dale Products, Inc., Columbus, Neb.*

For more information circle **443** on inquiry card.

LEVER SWITCH

New "BZ-2 RW 899 A2" adjustable-lever-actuated basic switch has operating position adjustable between 0.670" and 0.880"; is particularly well suited for use on timers, computers or other multi-mounted switch devices; is available in straight or formed lever designs; with or without a roller; solder type or screw terminals; wide selection of preset operating characteristics. All models are listed by UL at 15 amp 125, 250 or 460 vac; ½ amp 125 vdc; ½ amp 250 vdc.—*Micro Switch Div. Minneapolis-Honeywell, Freeport, Ill.*



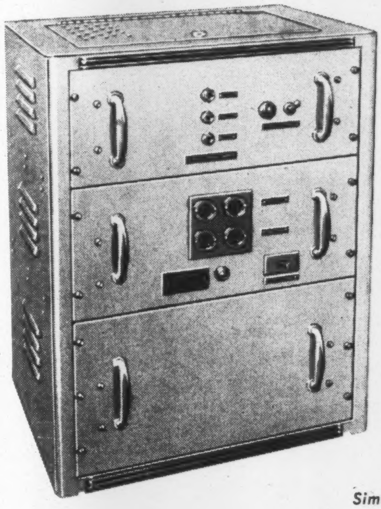
8056

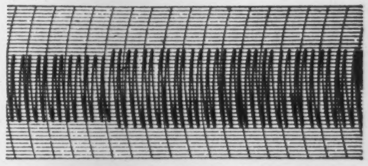
For more information circle **444** on inquiry card.

MINIATURE DC RELAY

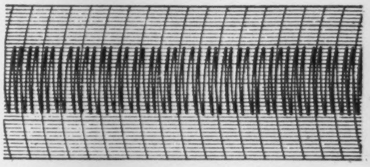
New "Type S" miniature dc relay 1" high overall, is suitable for use in low-cost equipment, radiosondes, ex-

Regulation in *less than* 1/50th cycle...





Output of typical electromechanical regulator in response to step change in input voltage. Average correction rate of 6v. per sec.



Output of Curtiss-Wright Distortion Eliminating Voltage Regulator from same input. Full recovery in 330 microsec.

Simultaneous two-pen recording of 60 c.p.s. voltage

PLUS Pure Sine Wave Power

CURTISS-WRIGHT LINE REGULATOR

- **Electronically regulates r.m.s. and peak voltage simultaneously to ±1%.**
- **Reduces typical power line distortion to less than 0.3%.**
- **Furnishes 1.4 KVA of distortion-free power.**
- **Introduces no phase shift between input and output.**
- **Simultaneously provides additional 4 KVA of ±1% electromechanically regulated power.**

Faster recovery time (less than 1/50th cycle, or 330 microseconds) plus the unique ability to *eliminate* line distortion — these are the reasons why the Curtiss-Wright Distortion Eliminating Voltage Regulator has been chosen by more and more laboratories and production test departments. Besides general laboratory use, this line regulator provides simpler, more accurate calibration of meters . . . better design of transformers, synchros, motors . . . easier testing of such components, with fewer rejects . . . easier, more accurate measurement of magnetic properties and receiver sensitivity . . . better a.c. computer performance . . . elimination of fast line transient effects. Write for details.

Electronic Component &
Instrument Sales Department

ELECTRONICS DIVISION
CURTISS-WRIGHT
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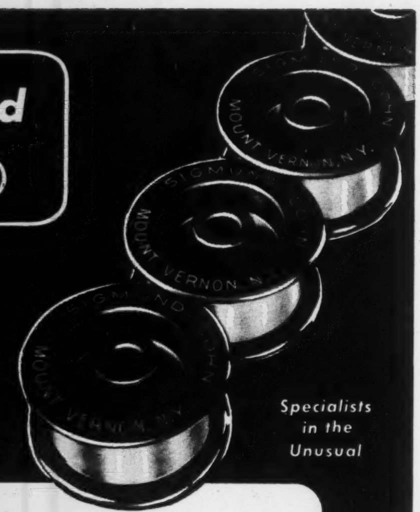
For more information circle **153** on inquiry card.

Electroplated WIRE

For Many Different Applications



Specialists in the Unusual

More and more people are turning to us for electroplated wire. We electroplate by continuous methods a wide variety of wire in a range of diameters from .035" to the smallest available. In our laboratory, Tungsten wire as small as .00015" has been electroplated with Gold . . . New applications for electroplated wires on different base materials are being developed from time to time . . .

Your inquiry is invited. Consult our staff, without obligation, about your specific wire problems.

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SIGMUND COHN MFG. CO., INC.
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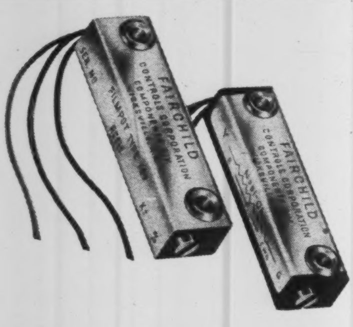
Write for List of Products.

For more information circle **154** on inquiry card.



Fairchild FilmPot® trimmers are high quality potentiometers offering operating characteristics of infinite resolution, precision adjustment, and stability of performance over a temperature range from –55 to +175°C. The Nobl-Ohm® metallic film resistance elements are evaporated continuous films of precious metal alloys.

METALLIC FILM TRIMMERS

The Types 768 and 769 FilmPot trimmers feature the exclusive Fairchild Nobl-Ohm resistance element in two small size, light weight units. Resistance range 50 to 25,000 ohms ±10%; infinite resolution; linearity ±5%; –55°C to +175°C operating temperature. Type 769 measures $^{11}/_{32}$ x $^{13}/_{32}$ x $1^{21}/_{64}$ and the smaller type 768 is ¼ x $^{5}/_{16}$ x 1¼ inches. Both types permit close stacking, and adjustment is obtained by a 28½ turn screw.

The answer to all your precision potentiometer problems can be found at Fairchild. For information write: Dept. 140-78B, Fairchild Controls Corporation, Components Division, 225 Park Ave., Hicksville, L.I., N.Y.

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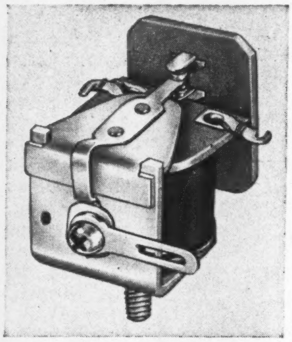
For more information circle **155** on inquiry card.

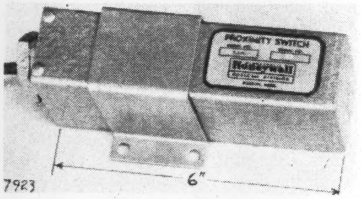


pendable devices, printed circuits, etc. Sensitivity 40 mw; contact rating 1½ amp at 115 vac; sp-dt; cross-bar contacts available.—*Comar Electric Co., 3349 W. Addison St., Chicago 18, Ill.*

For more information circle **445** on inquiry card.

PROXIMITY SWITCH

New magnetic switch detects objects containing iron on assembly lines, in liquids, etc.; has no moving parts; requires no physical contact with workpiece. Sensing poles are designed to detect metal objects within ⅛" of face. Thus, in machine tool operation, switch cannot be set off by falling chips.—*Doelcam Div., Minneapolis-Honeywell Regulator Co., 1400 Soldiers Field Rd., Boston, Mass.*

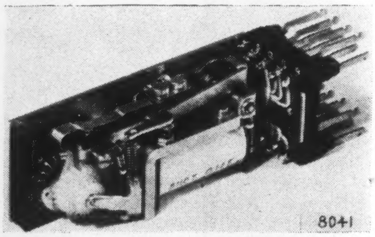


7923

For more information circle **446** on inquiry card.

HIGH-SPEED STEPPING RELAY

New "Type 7500/12," comprising a 12-point arc assembly, rotor assembly and driving motor, has a stepping speed of 80 steps per second with stepping pulses of a 50/50 make-break ratio. An impulse type of driving motor is used in standard unit with a 48-vdc 244-ohm coil. (Other voltages on special order). Relay's life exceeds ten million revolutions.—*International Standard Trading Corp., 22 Thames St., New York 6, N. Y.*



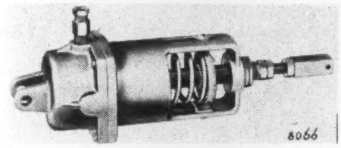
8041

For more information circle **447** on inquiry card.

MECHANICAL COMPONENTS

DIAPHRAGM MOTOR

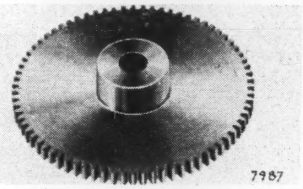
New three-inch "Powerstroke" diaphragm motor supplements 4" and 6" sizes; operates on air, water or oil pressure; provides thrusts to 80 lb; maximum stroke 2⅛"; is intended for gradual push-pull control of levers, etc. Strokes and starting pressures are adjustable.—*The Powers Regulator Co., 3434 Oakton St., Skokie, Ill.*



For more information circle **448** on inquiry card.

GEARS

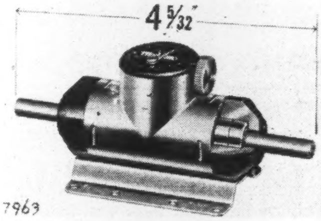
New spur pinions and gears are available with either solid hub and set screw (for economical general use) or split hub (for precise alignment of gear to shaft). Stainless steel pinions, face width 0.145", 20 to 36 teeth. Anodized aluminum gears, face width 0.125", 37 to 100 teeth as well as 120 and 160 teeth.—*Servo Corporation of America, 20-20 Jericho Turnpike, New Hyde Park, L.I., N. Y.*



For more information circle **449** on inquiry card.

ADJUSTABLE-RATIO SPEED CHANGER

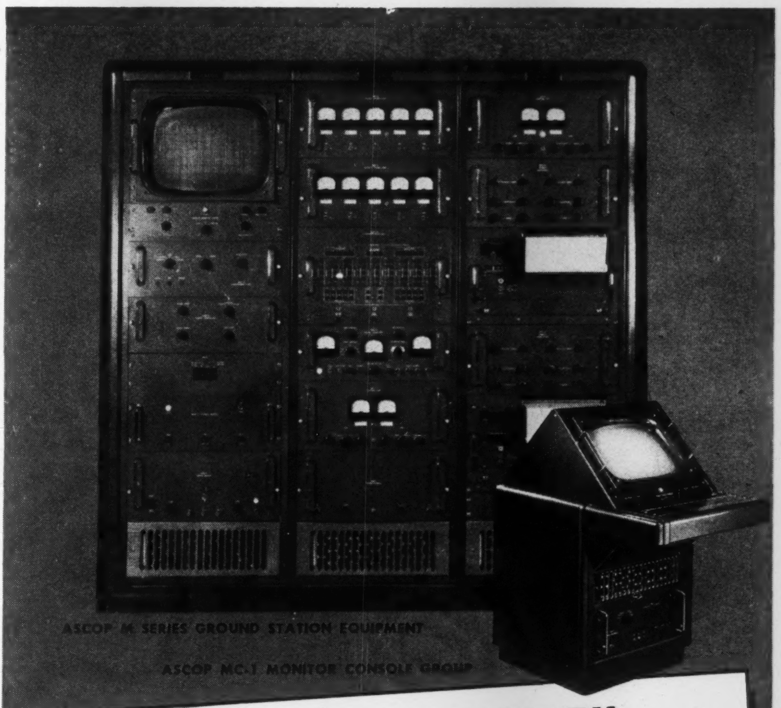
New improved model of maker's adjustable ratio speed changer has anodized aluminum end bells with two pressed fit ball bearings for each shaft. Concentricity between input and output shafts is held even closer than on former models which had phenolic end bells. —*Metron Instrument Co., 432 Lincoln St., Denver 3, Colo.*



For more information circle **450** on inquiry card.

RETAINING RINGS

New "Series 3000" internal retaining rings are available in 37 sizes, conform to National Aircraft Stand-


ASCOP M SERIES GROUND STATION EQUIPMENT
ASCOP MC-1 MONITOR CONSOLE GROUP

ASCOP PULSE WIDTH
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Achieves System Accuracies of Better Than 1%

PROVIDES FOR:

- Advance Station-Calibration, using locally generated setup signals
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- Simultaneous Visual Monitoring of all data channels
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- Easy Access to Slide Mounted Chassis, even during operation

Stations are sold only as combinations of standard or special tape recorder, monitor, decommutation or output recorder groups.

ASCOP Pulse Width Ground Station equipment, pictured above, complements ASCOP's PW Multicoders and Radio Telemetering Sets to provide complete "packaged" systems for operational testing of aircraft, missiles and other vehicles . . . and for static testing of engines, rockets, nuclear reactors and other powerplants.

Continuous automatic compensation of system zero and scale factor eliminates the need for critical components and frequent manual adjustment.

The M Series Ground Station uses intermediate magnetic tape speed change to operate directly from pulse width signals of 30x30, 45x20, or 90x10 configurations—or from any non-standard configuration having 30, 45 or 90 channels. All data channels may be visually monitored simultaneously.

All ASCOP equipment is designed for dependable accuracy, simplicity of operation, maximum life with minimum maintenance attention. ASCOP engineers will gladly consult with you, without obligation, on your current projects. Or write for detailed information, outlining your system requirements.

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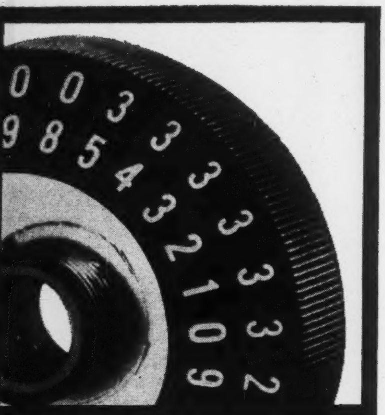
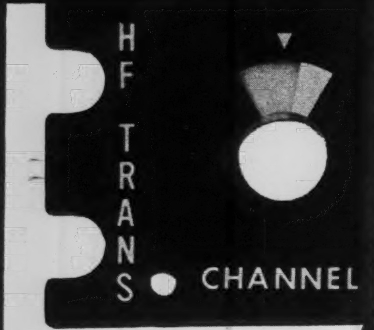
WE PROVIDE THE LEVER YOU MOVE THE WORLD

For more information circle 156 on inquiry card.

have you Edge Lighting Problems?

The unparalleled design flexibility of the Lackon® photo-marking process may offer you the best solution. With a minimum of gimmicks and gadgetry, Lackon® gives you a panel of unequalled marking accuracy, optimum legibility and lighting uniformity, with excellent resistance to severe environmental conditions. Designed, tested and quality controlled in our government approved laboratory, Lackon® edge lighted panels, knobs and knob skirts meet and exceed lighting, legibility and durability requirements of specification MIL-P-7788.





The Lackon® engineering staff of the United States Radium Corporation will readily assist your panel engineering department during the initial design stage. The cooperative application of their skill and experience in lighting techniques will speedily resolve design difficulties, result in decided production economies, and yield a remarkably superior finished product. For information write Dept. IA–10

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For more information circle **157** on inquiry card.

NOISE PROBLEM?

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RELY ON THE SKL VARIABLE ELECTRONIC FILTER

. . . For eliminaton of unwanted signals in your data

. . . For studies in vibration, dynamics, telemetering, acoustic noise and speech

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FEATURES:

- CONTINUOUSLY VARIABLE FOR HIGH-PASS, LOW-PASS, BAND-PASS AND BAND-REJECT
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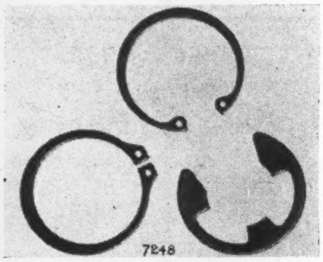
For more information circle **158** on inquiry card.

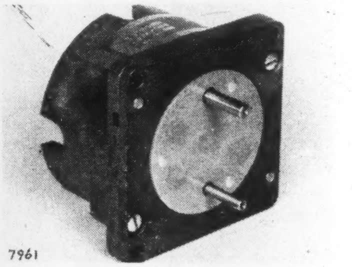


ards 50 and are applied axially into housings. "Series 3100" rings are made in 47 sizes, conform to NAS 51 and are applied axially to shafts. Both series, as well as maker's original "Series 1000" open-type rings, are available in carbon spring steel, stainless steel, phosphor bronze, and beryllium copper. Choice of many finishes. —*Industrial Retaining Ring Co., 8 West Sidney Ave., Mount Vernon 69, N. Y.*

For more information circle **451** on inquiry card.

DUAL OUTPUT GEAR BOX

New "Model 013" provides primary and secondary output shafts for use in servo systems where two constant ratio outputs are required. In some instances it eliminates a second servo system. Adapter kits are available to facilitate utilization of new gear box with various standard servomotors.—*Link Aviation, Inc., Binghamton, N. Y.*



For more information circle **452** on inquiry card.

TUBING, FITTINGS, etc.

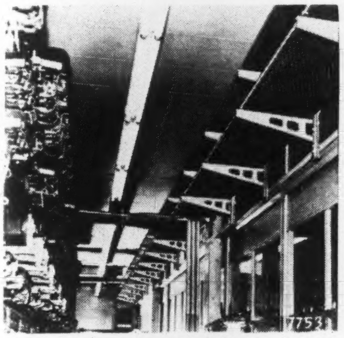
TRANSPARENT REINFORCED PLASTIC HOSE

New BARDEX reinforced plastic tubing, in sizes from ⅛" to 1" ID, is useful for fuel and oil lines, also suitable for use as an electrical conduit, requiring no joints or ground wires. Made from PVC, new tubing is extruded with a spiral steel wire reinforcement within wall, out of reach of fluids passing through or from outside abrasions. One advantage is guaranteed constant bore even if hose is bent or knotted. Completely weatherproof; self-extinguishing; resistant to gasoline, sea water, oils, high octane fuels, coal and butane gases and chemical solutions. Working temperatures 170°F down to 5°F. Typical recommended pressures from 200 psi for ⅛" ID to 100 psi for ½" ID.—*New-age International, Inc., 222 York St., Jenkintown, Pa.*

For more information circle **453** on inquiry card.

TUBING TROUGH SUPPORT

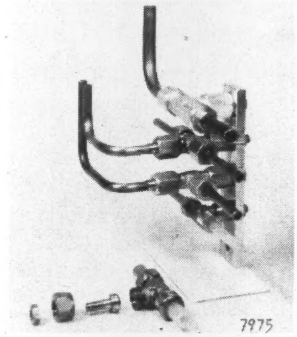
New "Rakit" cantilever-type support for maker's system of expanded metal trough for instrument tubing is secured by a twist of the wrist. Upright channel irons have pre-punched holes to provide a wide number of possible settings.—*Instrof Corp., Collegeville, Pa.*



For more information circle **454** on inquiry card.

TUBE-FITTING ANCHOR

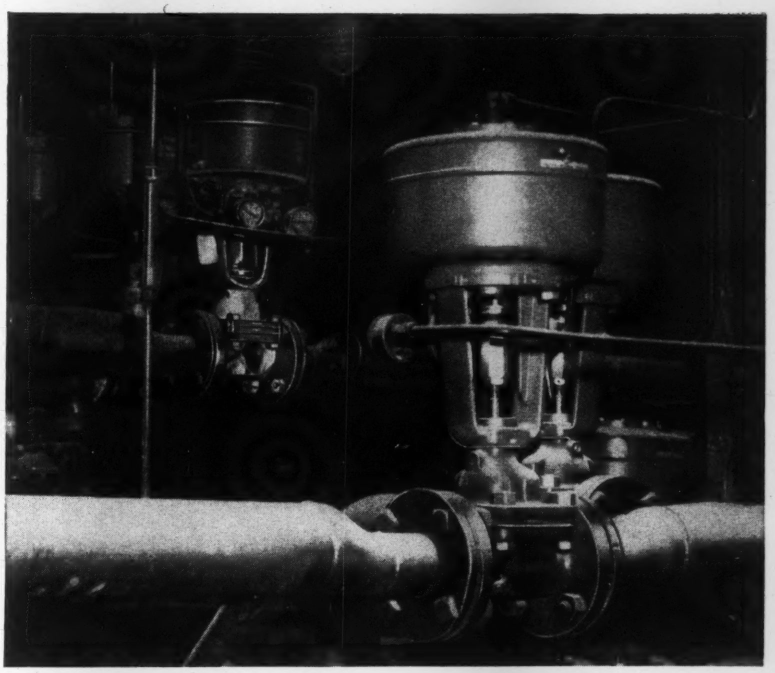
New tube fitting anchor or mounting stud is a bolt type adapter made in both "Intru-lok" (brass flareless type fittings especially for instrumentation lines) or "Triple-lok" (flare type fittings); is used to mount a tee or cross fitting directly to a bracket or in a threaded boss.— *Fittings Div., Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio.*



For more information circle **455** on inquiry card.

THREAD-CHANGE ADAPTER

New "FG5-S" adapter facilitates changeover from pipe threads to straight threads in various applications such as valves or other units too large to be removed to a bench for remachining of ports. "F" signifies a male pipe threaded end, "G5" indicates internal straight thread o-ring boss on other end, and "-S" denotes steel as material: After pipe



LEADING MANUFACTURER CUTS SERVICE COSTS

with CONOFLOW AIR-OPERATED SAUNDERS PATENT VALVES

This leading pigment manufacturer has little worry of being burdened by service problems with these Conoflow valves installed high up in the air in an inaccessible location. The illustration shows Saunders Patent Valves with Cylinder Conomotor Operators on an important application in a titanium processing operation at our customer's midwestern plant. Numerous successful installations in their several plants have convinced them of the dependability of Conoflow valve assemblies.

The Conoflow-Saunders Valve is a compact, lightweight unit which can be mounted in any position. The streamlined flow area of the valve body is free from pockets, grooves or crevices which cause clogging and sticking of slurries and semi-solids. Unique diaphragm gives tight shut-off and can be easily replaced. Positioners have no exposed moving parts.

Conoflow-Saunders Valves range in size from ½" all the way up to 12". They are available for "on-off" or throttling control service, using Conomotor operators specifically designed for automatic and remote control in conjunction with pneumatic instruments.

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FOREMOST
IN FINAL CONTROL ELEMENTS

Catalog HB-5 describes Conoflow Saunders Patent Valves in detail. Write for your copy today. Conoflow representatives are located in most principal cities.

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For more information circle **159** on inquiry card.

ULTRASONIC CLEANING BY THE SQUARE FOOT

Recent improvements in ultrasonic power-generating equipment, and the perfection of hermetically-sealed transducers operating at 40 kc/sec, have now made it economically feasible to apply ultrasonic cleaning to areas measured by the square foot. Up to now, cost and technical problems have largely confined the benefits of this fast and efficient technique to relatively small units.

The large, uniform radiating surface of the transducers makes them particularly suitable for the removal of buffing compounds, radioactive contamination, soldering flux, plaster, carbon smut, etc. The transducers can also be used for other processes such as quenching, plating, pickling, descaling and dyeing. The cleaning action penetrates deeply into blind holes and other areas difficult or impossible to clean by conventional methods.

The Branson LF-15 Transducers have a radiating surface 2⅝"x6", with thick barium-titanate driving elements that transmit the energy through the top of the stainless-steel housing directly into the cleaning solvent. The modular design of the transducers facilitates a wide choice of flush and focused arrangements of transducers.

Generator-Transducers combinations are available with radiating areas from ¼ to 10 square feet:

SONOGEN® MODEL	TRANSDUCER CLEANING AREA
AP-25	¼ Sq. Ft.
APT-100	1
APT-400	4
P-1000	10

Cost of complete equipment, per square inch of radiating surface, ranges from $23 down to $14. We will be happy to send you complete information on request.

BRANSON ULTRASONIC CO.
Division of Branson Instruments Inc.
3 BROWN HOUSE ROAD
STAMFORD, CONN.

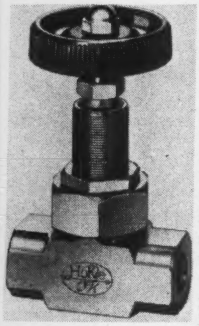
For more information circle **160** on inquiry card.

threaded end is screwed into valve port, it is welded for a permanent joint, leaving other end of adapter providing new straight thread mounting boss.—*Tube & Hose Fittings Div., Parker Appliance Co.,* 17325 *Euclid Ave, Cleveland* 12, *Ohio.*

For more information circle **456** on inquiry card.

VALVES, etc.

VALVE FOR PILOT PLANTS

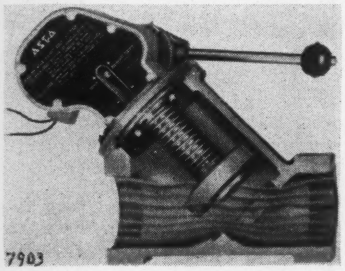


New stainless-steel union-bonnet globe needle valve, designed specifically to solve problems of pilot plant designers, features interchangeability of parts and body styles. A stock valve can be modified by user to meet conditions from vacuum to high pressure, distilled water to corrosive fluids. Sizes from ¼" to ½".—*Hoke Inc.,* 148 *S. Dean St., Englewood, N. J.*

For more information circle **457** on inquiry card.

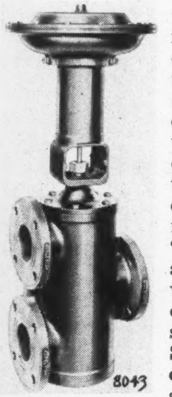
SAFETY SHUT-OFF VALVE

New "Bulletin 8022" safety shut-off manual-reset solenoid valve shuts off fuel automatically and instantly upon failure of power. 1¼" to 3" sizes are approved by Factory Mutual; are designed to control gases in a maximum ambient of 104°F; can be used also to handle fuel oil and non-corrosive liquids. Sizes from ¾" to 6" ips; pressures from 25 to 100 psi.—*Automatic Switch Co.,* 391 *Lakeside Ave., Orange, N. J.*



For more information circle **458** on inquiry card.

BY-PASS VALVES

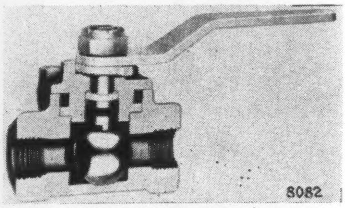


New line of three-way by-pass valves for accurate control of liquid flow features constant total capacity regardless of position of inner valve. Flow can be directed to either of two outlets. Tight-closing feature makes new valves "ideal for diverting applications which would ordinarily require the use of two separate valves." Simple maintenance: change discs and seat rings without removing valve from pipe line. Available in 2½", 3" and 4" sizes; other sizes shortly. Proportional or two-posion control.—*Johnson Service Co., Milwaukee* 1, *Wis.*

For more information circle **459** on inquiry card.

BALL VALVE

New ball valve is said to be "the first on the market to incorporate both the Top-Entry (for easy in-line



C-I-L

INSTRUMENT ENGINEER

Our Plastics Division has an opening for an instrument engineer to work on the design and maintenance of instrument circuits and arrangements. Location would be the Division's polythene plant at Edmonton, Alta.

Preference will be given to graduates in physics or engineering having experience with pneumatic and electronic instruments.

Inquiries may be addressed to:

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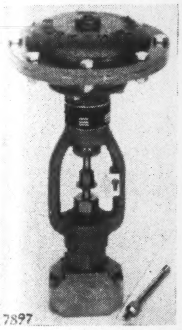
Canadian Industries Limited
P.O. Box 10, Montreal

maintenance) and Twin-Seal (for positive shut-off with flow from either direction)." Round opening in ball allows piping to handle fluids with minimum turbulence in line. Another feature is wiping action on both sides of ball. Replacement of seat rings can be accomplished quickly and easily without removing valve from line.—*Worcester Valve Co., Inc., Worcester, Mass.*

For more information circle **460** on inquiry card.

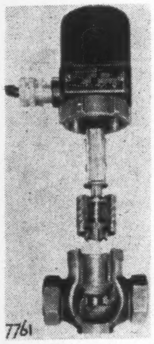
VALVES FOR PILOT PLANTS


7897

New "Series 800" valves have diaphragm operators for on-off or 3-15-lb control, air to open, or air to close. Bodies are bar-stock with screwed ends, straight-through or angle, removable seats and spline plug. Ratings to 15,000 psi. Flow control is governed by shape of grooves or slots milled into plug surface. Parabolic plugs with removable seats are also available. C_v 0.0001 to C_v 2.5 with spline plug and removable seat. Sizes: ¼" to 1".—*Uniflow Valve Corp., 19 Quine St., Cranford, N. J.*

For more information circle **461** on inquiry card.

SOLENOID VALVES

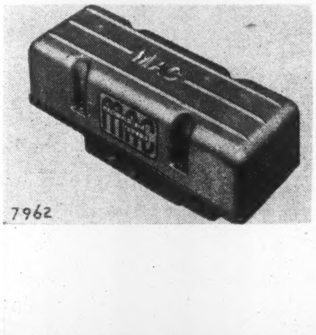

7761

New solenoid valves feature a removable operating assembly to facilitate inspection and cleaning or complete replacement of operating parts without disturbing electrical connection (if flexible conduit is used), and while valve body remains in pipe line. Disassembly can be completed in three simple steps.—*The Magnatrol Valve Corp., 72 Fifth Ave., Hawthorne, N. J.*

For more information circle **462** on inquiry card.

FOUR-WAY AIR VALVES

New "Models 1013 and 1023" 3-position 4-way double-solenoid air valves feature a neutral position and are



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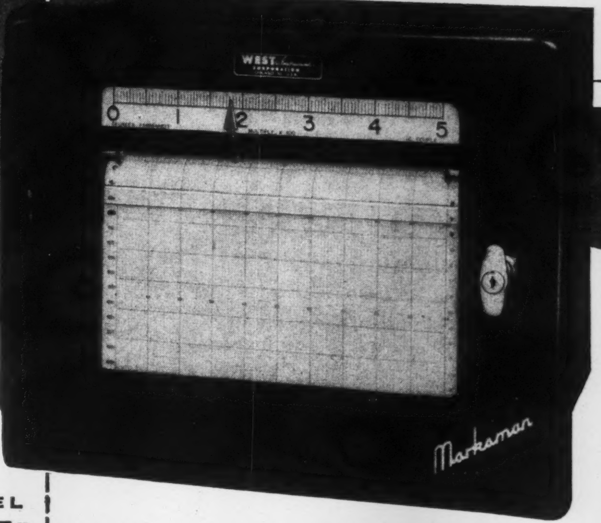


NEW by WEST

MODEL "M" SERIES

Marksman tubeless electronic potentiometer strip chart RECORDER for recording and controlling such variables as temperature, speed, strain, pH and many others.

- No vacuum tubes. Sensitivity of 5 micro-volts or less.
- Potentiometer for thermocouple (TCB protected) or radiation pickup, Wheatstone bridge for resistance pickup.
- Full selection of standard scale ranges . . . 11" calibrated chart width.
- Selector knob changes chart speed . . . 5 speeds per unit without gear change.
- Single or multi-record units available.
- Equipped for 115 or 230 volts — no transformers needed.
- Additional features: Automatic standardization . . . cold junction compensation for thermocouple use . . . battery condition indicator for potentiometer . . . built-in chart saver . . . designed for standard 19" relay rack.

WEST Instrument CORPORATION
SALES OFFICES IN PRINCIPAL CITIES
4355 W. MONTROSE, CHICAGO 41, ILL.
British Plant: WEST INSTRUMENT LTD.
52 Regent St., Brighton 1, Sussex
Represented in Canada by Upton, Bradeen & James

NOW you can have all these practical advantages in a single instrument. Write for Bulletin M.

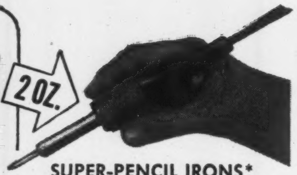
*the trend is to **WEST***

For more information circle **161** on inquiry card.

Now you can
solder as easy as you write!
—with
HEXACON
INSTRUMENT
SOLDERING IRONS
—for fast soldering and long life on constant duty

Because of new efficient design, these tiny tips out-perform irons with larger tips and higher wattages. HEXACON offers a new standard in soldering iron efficiency for every conceivable need in the soldering of miniature assemblies.

Send for new circular No. 127 giving more details and comparative competitive performance data.



SUPER-PENCIL IRONS*
No. 25S 25w. 1/8" tip $6.00
No. 26S 30w. 3/16" tip $6.00

BANTAMWEIGHT HATCHET IRONS*
No. 25H 25w. 1/8" tip $6.50
No. 26H 30w. 3/16" tip $6.50

PIN-POINT IRONS*
No. P-25A 25w. 1/8" tip $6.00
No. P-26 30w. 3/16" tip $6.00

**Also available in higher wattages*

INDUSTRY'S No. 1 HEXACON SOLDERING IRON

HEXACON ELECTRIC COMPANY
506 West Clay Ave., Roselle Park, New Jersey

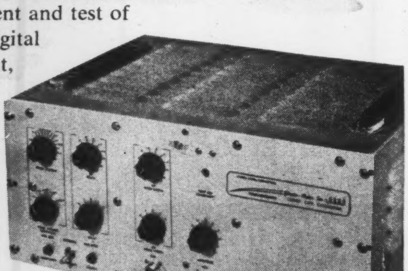
For more information circle **162** on inquiry card.

Electro-Pulse
PULSE INSTRUMENTATION

- PULSE GENERATORS
- TIME DELAY GENERATORS
- PULSE CODE GENERATORS
- MAGNETIC CORE TESTING EQUIPMENT
- BLOCK UNITS FOR TEST SYSTEMS

VERSATILE . . . . . . WIDE RANGE . . . ACCURATE . . . SERVICEABLE

Utilizing advanced circuitry, Electro-Pulse offers a broad line of proven equipment for applications in development and test of RADAR, navigational aids, digital computers, data handling equipment, fire control systems, guided missile control, ballistics research, etc.



MEGACYCLE PULSE GENERATOR MODEL 3450A ▸
20 CPS to 2 Megacycles
0.1 to 5 μs pulse width
0.1 to 5 μs pulse delay
50 volt low impedance output

Representatives in Major Cities

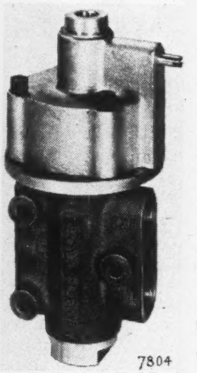
EP *Electro-Pulse, Inc.*
11861 TEALE ST., CULVER CITY, CALIF. • Phone: EXmont 8-6764 or TExas 0-8006

For more information circle **163** on inquiry card.

available with either open center ("1013") or closed center ("1023"). Available in ⅜" size.—*Mechanical Air Controls, Inc.*, 10030 *Capital, Oak Park, Detroit* 37, *Mich.*

For more information circle **463** on inquiry card.

TIME DELAY VALVES

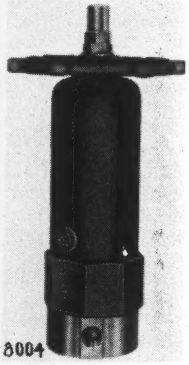


7804

New pilot-operated, 2-way, 3-way and 4-way time delay valves utilize volumetric principle to provide delayed actuation with immediate reversal or immediate actuation and delayed reversal. Operating times of 0 to 5 minutes by manual preset adjustment. New valves can be remotely controlled. Available in ¼", ⅜", ½" and ¾" sizes.—*Airmatic Valve, Inc.*, 7313 *Associated Ave., Cleveland* 9, *Ohio.*

For more information circle **464** on inquiry card.

HP REDUCING-RELIEF VALVE

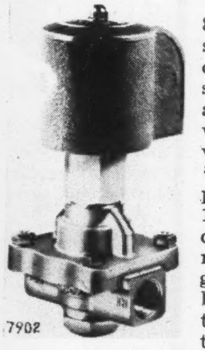


8004

New "No. 385 Type F" combination pressure-reducing and relief valve for air, gas, oil or water service operates on initial pressures to 4000 psi. Control pressures can be varied by as little as 2 psi over a range as wide as 0-2500 psi. Valve is single-seated, spring-loaded and diaphragm-actuated. —*Atlas Valve Co.*, 280 *South St., Newark* 5, *N. J.*

For more information circle **465** on inquiry card.

H-P HEAVY FUEL OIL VALVE



7902

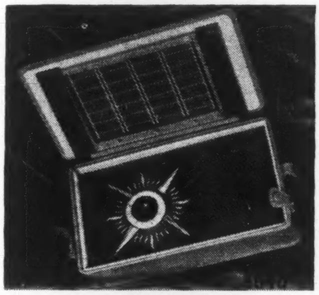
New "HV 44-816" high-pressure heavy-fuel-oil pilot-operated solenoid valve is a packless two-way bronze body valve with full ¾" port and a pressure range of 15 to 300 psi; closes when solenoid is de-energized; is approved by Factory Mutual; features tight shut-off, positive operation, and built-in strainer.—*Automatic Switch Co.*, 391 *Lakeside Ave., Orange, N. J.*

For more information circle **466** on inquiry card.

MISCELLANEOUS

SUN BATTERY

New "Type SB-24B5" converts sun's radiant flux into electric power (illustrated as a power supply for a transistorized radio); is said to offer "the greatest economy in milliwatts per dollar of any type of photovoltaic energy converter"—*International Rectifier Corp., El Segundo, Calif.*



For more information circle **467** on inquiry card.

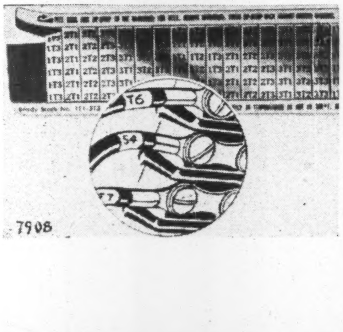
PROXIMITY PICKUP SYSTEMS

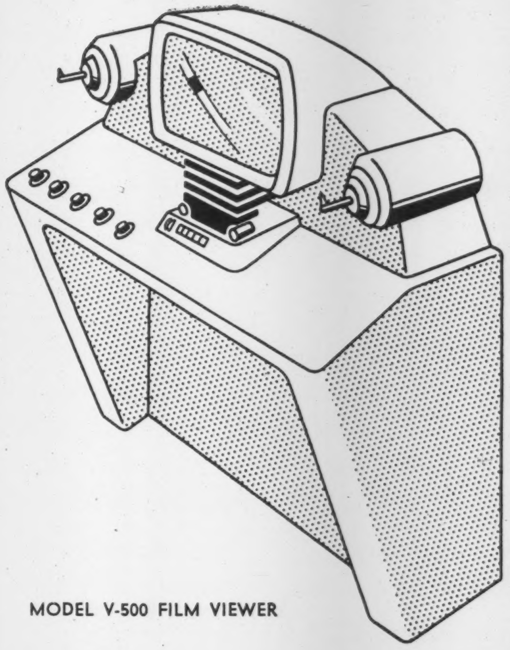
New "4950 Series" high-frequency carrier-operated proximity pickup systems can detect presence of metal objects at twice the maximum range of maker's "4900" system: up to ¾" away through such nonmetallic substances as plastic, wood, etc., at rates up to 1000 units per second. New systems operate on 115 vac and feature a sensitivity control which adjusts to desired operating ranges and compensates for ambient temperature changes.—*Electro Products Labs., 4500 N. Ravenswood Ave., Chicago 40, Ill.*

For more information circle **468** on inquiry card.

WIRE MARKERS

New self-sticking aluminum foil metal wire markers feature high resistance to oils and solvents; are thin (3 mils) and conform to wires with-





✱ MODEL V-500 FILM VIEWER

Richardson CAMERA CO

✱ WE SPECIALIZE IN THE DESIGN AND MANUFACTURE OF FILM MOTION EQUIPMENT OF ALL TYPES. WE WELCOME THE UNUSUAL PROJECTS OTHER MANUFACTURERS CAN OR WILL NOT ASSUME.

Richardson CAMERA CO

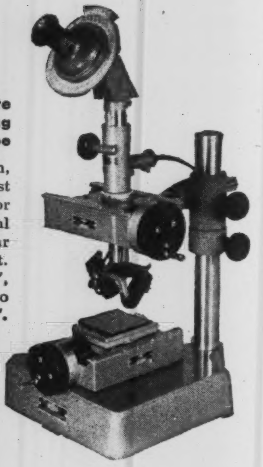
✱ WE BEGAN IN 1936 WITH ANIMATION AND SPECIAL EFFECTS DEVICES FOR THE FILM INDUSTRY. NOW WE LARGELY SERVE INDUSTRY'S ACCELERATED DEMANDS FOR TEST DATA RECORDING AND VIEWING EQUIPMENT.

Richardson CAMERA CO

✱ WE ENTHUSIASTICALLY PURSUE A BUSINESS POLICY OF INTEGRITY AND QUALITY IN EVERY DETAIL. WE TRUST THIS SERVICE APPEALS TO YOU. WE WELCOME YOUR INQUIRIES AND PROBLEMS.

Richardson CAMERA CO
BURBANK CAL

For more information circle **164** on inquiry card.



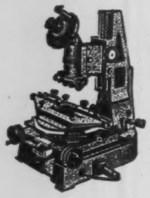
Coordinate Measuring Microscope

High precision, low cost instrument for 2-dimensional linear measurement. Range 2" x 2", reading to 0.0001".

Cut rejects, speed production

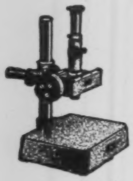
Fast, reliable readings to 0.0001" with Gaertner measuring microscopes

Precise, versatile, easy-to-use Gaertner measuring microscopes assure positive, direct measurement of precision parts. You see clear, sharply-defined images. No physical contact to distort or injure object being measured. Enjoy new production savings with Gaertner optical instrumentation. Write for complete data on the Gaertner line of industrial microscopes.



Toolmakers' Microscope

Ultimate in measuring microscopes. Range 2" x 4", reading to 0.0001", angular measurement to 1 minute.



Micrometer Slide Comparator

Reliable, low cost instrument for linear measurement. Ranges up to 4", reading to 0.0001" or 0.00005".

Filar Micrometer Microscope

High quality, low cost instrument for extremely precise measurements. Range 0.08", reading to 0.00002".

Write for Bulletin 161-54 showing applications, models, specifications.

The Gaertner Scientific Corporation
1211 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

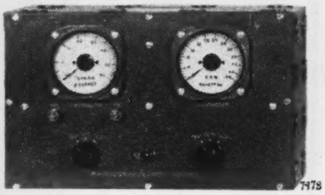
For more information circle **165** on inquiry card.

out bulking; withstand constant operating temperatures up to 375°F; come on handy "Blue Streak" dispenser cards for quick application; have a protective silicone plastic overcoating.—*W. H. Brady Co., 727 W. Glendale Ave., Milwaukee 9, Wis.*

For more information circle **469** on inquiry card.

SPARK PROTRACTOR AND TACHOMETER

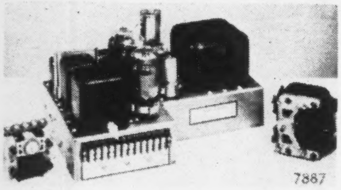
New "SAT-300," for measuring spark angle and engine speed of modern automotive engines under road load conditions, operates directly from a 12 vdc battery system. Scale is graduated from −10° to 60° advance in one-degree divisions. Hand calibration is accurate to 1° over a speed range from 300 to 4800 rpm.—*Photocon Research Products, 421 N. Foothill Blvd., Pasadena 8, Calif.*



For more information circle **470** on inquiry card.

SERVOMOTOR & AMPLIFIER

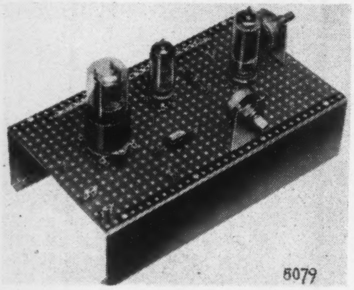
New "Servo Kit," for experimentation and demonstration, comprises one servo amplifier, two servomotors, a 2-volume Rider training course ("Basic Synchros and Servomechanisms") and an instruction guide.—*Servo Systems Co., 55 Meeker Avenue, Newark, N. J.*

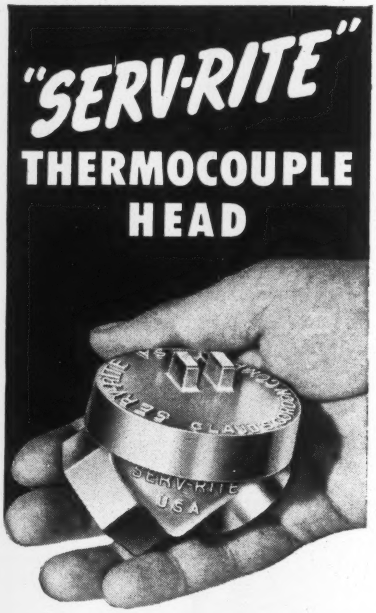


For more information circle **471** on inquiry card.

EXPERIMENTER'S CHASSIS KIT

New Experimenter's Chassis Kit provides quick set-up of electronic circuitry with simple hand tools; is suitable also for more permanent use





"SERV-RITE" THERMOCOUPLE HEAD

the head that's ahead in every way . . .

This new "Serv-Rite" thermocouple head is actually small enough to be held comfortably in the palm of your hand. But size is only one of the many features that make this thermocouple head really extraordinary. It is loaded with installation and service conveniences that any user of thermocouples will appreciate at once.

The body is of malleable iron, cadmium plated for durability. A new type friction lock assures easy removal or tightening of the cap — a quarter turn does it. An asbestos gasket makes the head dirt- and moisture-proof. With a choice of ½", ¾", or 1" IPS opening for the protecting tube, you can standardize on one style head.

The connector block is of a material especially selected to withstand, without damage, temperatures up to 900° F. in continuous service. Improvements over the conventional type of inserts greatly simplify the making of the lead wire connections. The complete thermocouple element, including connector block, can be easily withdrawn for inspection.

Install a "Serv-Rite" thermocouple head and see for yourself how much better it really is.

Write for complete details

5606

GORDON SERVICE

CLAUD S. GORDON CO.
Manufacturers · Engineers · Distributors
Thermocouples & Accessories · Temperature Control Instruments · Industrial Furnaces & Ovens
Metallurgical Testing Machines

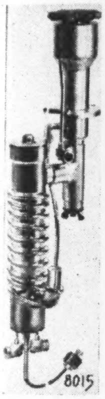
609 West 30th Street, Chicago 16, Illinois
2025 Hamilton Avenue, Cleveland 14, Ohio

For more information circle **166** on inquiry card.

and can be mounted. Decks are 4¾" x 8½" or 4¾" x 17" and are packed with a variety of accessories. Feature: Push-In Terminal whereby, with a wire of any size between 0.030" and 0.045", connections need not be soldered for temporary testing.—*Vector Electronics Co., 3352 San Fernando Rd., Los Angeles 65, Calif.*

For more information circle **472** on inquiry card.

HI-VAC PUMP AND PORT



New "Type 3116-03" stainless-steel high-vacuum pump-and-port assembly, expected to find wide use in evacuation of cathode-ray tubes, has a pumping speed of 5 liters per second at port opening and attains an ultimate pressure of 2×10^{-6} mm Hg. Port accommodates ⅜" or ½" tubulations; is water-cooled; is connected at a right-angle to pump so that broken glass cannot enter pump jet area.—*Consolidated Electrodynamics Corp., 1775 Mt. Read Blvd., Rochester 3, N. Y.*

For more information circle **473** on inquiry card.

TV CAMERA

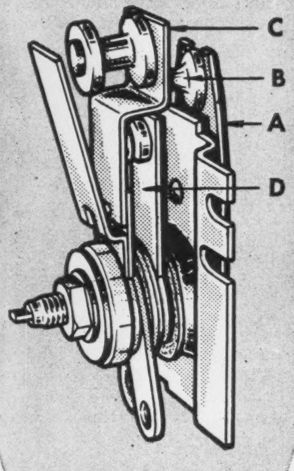
New "Utilicon 600" features extremely high sensitivity, "several times greater than other tubes of its type." Surface characteristics are such as to provide more uniform background shading and black to white contrast. Resolution capability is 600 lines; side tubulation eliminated to permit rotation to obtain maximum horizontal resolution. "600" is readily interchangeable with tubes used in customary industrial TV cameras.—*Electronic Sales Dep't, Diamond Power Specialty Corp., Lancaster, Ohio*

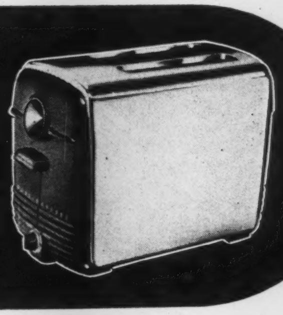
For more information circle **474** on inquiry card.

CLOSED-CIRCUIT TV CAMERA

New "Model TVC-1" package, including Vidicon, *f*-1.9 lens, multi-conductor cable and control generator, provides one high-definition video output and two RF outputs for direct connection to standard TV receivers. All outputs can be used simultaneously and several cameras and any number of receivers can be connected in one closed-circuit system. Control generator operates up to 500 ft from camera and output signal carries thru

Observer
8009





HOW CHACE
THERMOSTATIC
BIMETAL ACTUATES THE
WESTINGHOUSE

Pop-Up Toaster

Westinghouse Elec.
Corporation
Mansfield, Ohio

Uniform toasting in just 90 seconds is featured by this new Westinghouse pop-up toaster. A new type of heating element is combined with a reflector on each side of the two slices. Its unique dual element thermostat compensates for variations due to voltage fluctuations and reduced browning of the second and third slices. The controlling elements are accurate, dependable Chace Thermostatic Bimetal, of course.

The operation of the thermostat is ingenious: the right hand bimetal element (A) controls the temperature of the air in the toasting chambers, hence the degree of browning. This highly responsive bimetal is positioned so it is exposed to the radiation from the heating element. High voltage (more heat) makes the element deflect to the left and the ceramic point (B) moves the upper spring-mounted contact arm at (C), opening the circuit, thus preventing over-browning. When voltage drops, the effect is opposite.

The left hand bimetal element (D) controls browning of second and third slices. Being of a much less responsive type, it is gradually deflected to the left by the ambient temperature in the toaster, moving the contact arm (C) and prolonging the period of the circuit.

Chace Thermostatic Bimetal is available in 28 types, in strip, coil or completely fabricated and assembled elements made to your specification. Write for new 44-page booklet, "Successful Applications of Chace Thermostatic Bimetal," containing interesting uses of bimetal, formulas, calculations. etc.

IT BENDS WITH THE HEAT

W. M. CHACE CO.
Thermostatic Bimetal
1609 BEARD AVE., DETROIT 9, MICH.

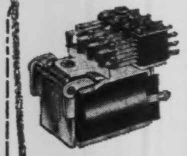
For more information circle **167** on inquiry card.

SWITCH TO AUTOMATIC CONTROL!

With **AEMCO**

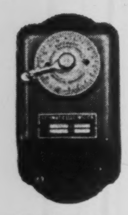
the complete line of relays, timers and time switches

Specialists in the control field for more than 30 years, AEMCO offers you fresh, new ideas . . . ideas that save you money in automatic control . . . ideas that save you valuable time. Your inquiries are invited write for complete information.



RELAYS

At AEMCO we specialize in both the design and manufacture of relays to your mechanical and electrical specifications. Should one of hundreds of stock AEMCO relays fail to meet your specialized requirements exactly, we will be happy to build a unit not only to meet, but to exceed those specifications.

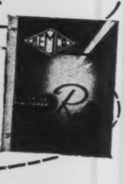


INDUSTRIAL TIME CONTROLS

Now control that vital operation automatically! Available in many different models with automatic or manual re-set, AEMCO industrial time controls help eliminate waste . . . help speed up production. Variations are available on standard cycling models . . . dials are easy to read, easy to set.

Write Today

For detailed information on AEMCO Relays or the complete AEMCO Industrial Time Control line.



AEMCO INCORPORATED

60 State Street • Mankato, Minn.

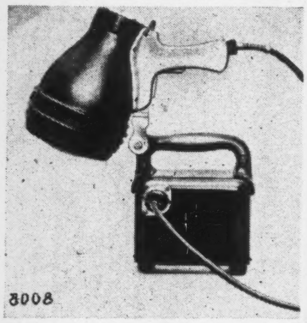
For more information circle **168** on inquiry card.

2000 ft of RG-11/U cable before line amplifiers are inserted.—*Blonder-Tongue Labs, Inc., 526-536 North Ave., Westfield, N. J.*

For more information circle **475** on inquiry card.

ULTRAVIOLET SOURCE

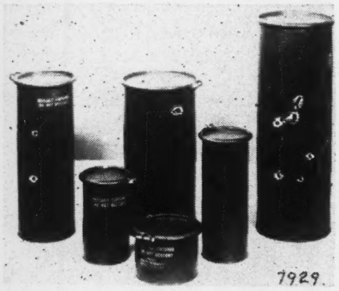
New "Blak-Ray Model B-100" provides long wave ultraviolet radiation for chromatography, lab research, inspection and medical observation; is a concentrated source of 3660-Angstrom radiation readily adaptable to any task. Lamp head is attached to base through a spring-tension arm which allows uv beam to be rotated 180° but can be slipped from base and held in hand by pistol-grip handle.—*Black Light Corp. of America, San Gabriel, Calif.*



For more information circle **476** on inquiry card.

RE-USABLE SHIPPING CONTAINERS

New re-usable shipping containers in a wide range of "non-standard" body heights offer substantial savings by eliminating interior cushioning, exterior crating and shipping space.—*George D. Ellis & Sons, Inc., American & Luzerne Sts., Philadelphia 40, Pa.*

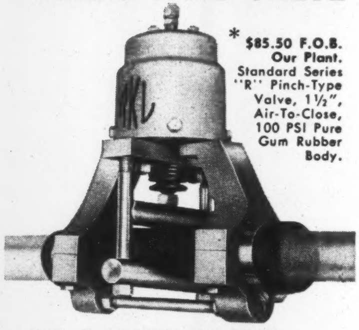


For more information circle **477** on inquiry card.

LIQUID-LEVEL GAGE GLASS CLEANING ROD

New cleaning rod really gets the inside of liquid-level gage glasses clean; does not employ a brush. A tubular cloth swab is slipped over a piece of corrosion-resistant spring steel on end of rod. A detergent or other cleaning medium is applied to swab; rod is then inserted into end

compare this PINCH-TYPE VALVE



* $85.50 F.O.B. Our Plant. Standard Series "R" Pinch-Type Valve, 1½", Air-To-Close, 100 PSI Pure Gum Rubber Body.

ON QUALITY ALONE . . .

ON COST ALONE*

No matter how you compare an RKL pneumatically - operated pinch valve . . . it always comes out on top. Check these exclusive features and you'll see why.

- Rolling diaphragm air motor . . . proven in millions of tough applications . . . unmatched for positioning accuracy and linearity.
- Stainless steel stem and guide rods . . . resist corrosion and wear.
- Solid cast aluminum alloy frame . . . light weight combined with high mechanical strength.
- Pinch limit stops . . . prevent over-pinch regardless of air pressure . . . longer body life . . . no accidental failures.
- Completely self-supporting . . . never any need to give an RKL valve extra support.

SPECIFICATIONS IN BRIEF

PIPE SIZE: All standard pipe sizes, ¼" to 14".

TYPES: Air-to-open, air-to-close, quick-acting hand lever operated, handwheel operated, solenoid operated, hydraulically operated.

CONNECTIONS: Flanged or slide-on.

BODY MATERIAL: Pure gum rubber is standard. Teflon, polyethylene, other rubbers available.

DIMENSIONS AND WEIGHT: 1½" valve illustrated above measures approximately 11½ x 6 x 12 and weighs just less than 14 pounds.

BULLETIN 1154 gives a complete description of RKL pinch valves, applications, body materials, capacities, etc. . . . *a handy reference guide that's yours on request.*

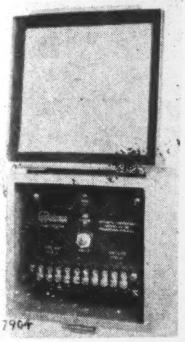
RKL VALVE & MANUFACTURING CO.
ROUTE 38 & RUDDEROW AVE.
MAPLE SHADE, NEW JERSEY

For more information circle **169** on inquiry card.

connection of gage (or drain in offset of valve). When swab is visible in glass, simply pull back handle and tighten thumbscrew: result is an increased arc of spring, forcing swab against glass. Standard length 36"; longer lengths on order.—*Jerguson Gage & Valve Co.*, 80 *Fellsway, Somerville* 45, *Mass.*

For more information circle **478** on inquiry card.

DEMODULATOR

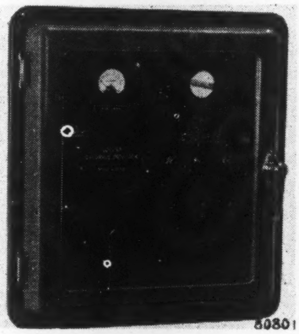

7904

New "Series 6101 D" supplies differential transformers and converts their output to dc for use with micrometers, recording potentiometers, etc.; can be located up to 1000 ft from transmitter (on 4-wire cable) and several thousand ft (on 2-wire dc); features stability of better than ¼% with line variation of 10%. Calibrating circuit permits testing at any time without disturbing transmitting device. No vacuum tubes or choppers are used: only magnetic and semiconductor devices of highest quality.—*Automatic Temperature Control Co., Inc.*, 5200 *Pulaski Ave., Philadelphia* 44, *Pa.*

For more information circle **479** on inquiry card.

CHLORINE DETECTOR

New "Series A-689 Solvay Chlorine Detector" monitors a continuous controlled sample of air, warning when chlorine concentrations in the air exceed 3 parts per million; thus gives a warning long before a concentration of 15 ppm is present that would cause throat irritation. Made for either wall or panel mounting.—*Wallace & Tiernan Inc.*, 25 *Main St., Belleville* 9, *N. J.*


80801

For more information circle **480** on inquiry card.

CORRECTION

In item on "Series 185" pressure transmitter of Manning, Maxwell & Moore (August issue, page 1580) repeatability should be "0.0002" or "0.02%" but not "0.0002%."

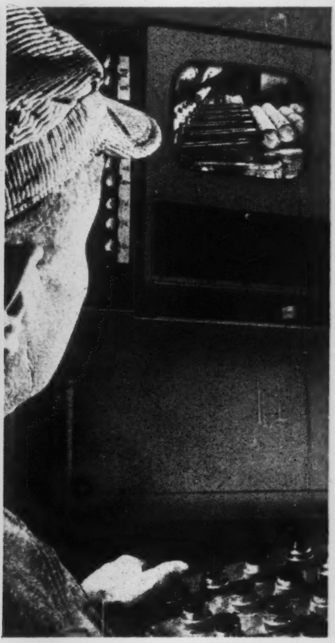
TIMKEN Company

ORDERS 2 MORE DIAMOND ITV UNITS

(*WIRED TELEVISION*)

AFTER 3 SUCCESSFUL INSTALLATIONS

Picture of furnace interior on Diamond ITV viewing screen is watched by remote dispatcher. A flip of a switch and he SEES conditions in another furnace on same screen.



Operator at another control pulpit SEES a visually inaccessible billet loading area for a pusher type furnace.

The Timken Roller Bearing Company made its first application of Diamond Industrial TV in August 1951 for remote observation of the interior of a tube-cooling furnace. Since that time two additional installations have been made to watch (1) the inside of another furnace and (2) the remote handling of billets by a crane. The success of these has resulted in a recent order for two more sets of Diamond ITV.

You, too, probably can use Diamond ITV to substantial advantage. Call your Graybar Distributor or use the coupon below.

7530

Distributed by GraybaR ELECTRIC COMPANY

DIAMOND POWER SPECIALTY CORP.
"FIRST IN INDUSTRIAL TELEVISION"
ELECTRONICS DEPT., P.O. BOX 56MM
LANCASTER, OHIO

Please send me without obligation a copy of new bulletin showing how Diamond Industrial (Wired) Television will help me reduce costs, improve quality, increase sales and aid safety.

Name____________________
Title____________________
Company____________________
Address____________________

For more information circle **170** on inquiry card.

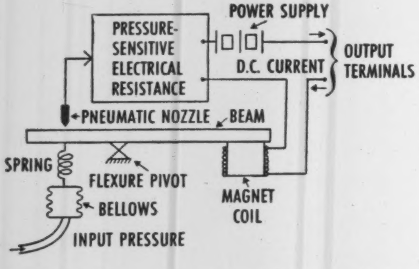
INSTRUMENTS and AUTOMATION Briefs

For this literature circle number on inquiry card.

P-E-P

P-E-P is new . . . the Pneumatic-Electric-Pneumatic Transmission system that converts all process variables to a direct current for simple transmission, and reconverts to a pneumatic output, without tubes or complex circuitry. It converts the output of any transducer to a signal of 3-15 milliamperes for transmission electrically. The receiver converts the DC signal to pneumatic pressure of 3-15 PSI for actuating valves or other equipment.

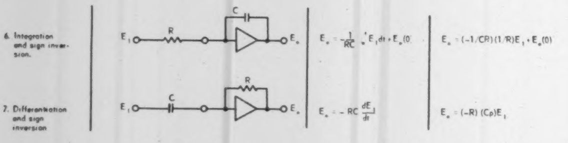
When used with a pneumatic or mechanical transducer (see illustration) the P-E-P System balances forces on a flexure mounted beam. Beam unbalance is detected by a nozzle, causing variation of a pressure-sensitive resistance (carbon pile). This changes a rebalancing direct current (3-15 MA) . . . The operation of the receiver is similar . . . except that the transmitted current is received by a magnet coil, the pressure-sensitive resistance is replaced with a pneumatic pilot valve, and the output pressure is fed back to the bellows to rebalance the beam. (*From new 2-page brochure announcing this new electrical transmission system for pneumatic systems, Robertshaw-Fulton Controls Co., Fielden Div., 2920 N. 4 St., Phila. 33, Pa.*)



For this literature circle **501** on inquiry card.

Programming Analog Computers

The operational equation of a circuit may be defined as an equation which relates the output to the input in terms of the mathematical operation performed by the circuit on the input . . . Electronic computers are characterized by their ability to perform certain mathematical operations electronically. Whereas addition and subtraction are the basic operations of digital computers, analog computers can perform these and a variety of others such as integration, multiplication, differentiation, etc., in their repertoire of basic operations. Also, just as integration and multiplication are composite operations in digital computers, electronic analog computers perform composite operations by combining several or all of the basic ones. This is the underlying principle of their use, and rules may be easily established to find the necessary combination for solving a given problem . . . (*From new 12-page Data File 120, Berkeley Div. of Beckman Instruments, Inc., 2200 Wright Ave., Richmond 3, Calif.*)

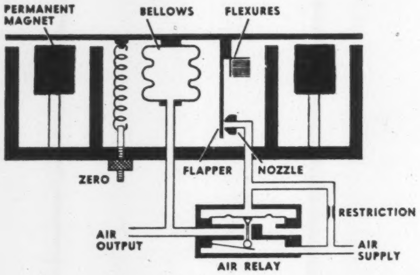

6. Integration and sign inversion.
7. Differentiation and sign inversion
E_1
R
C
E_o
$E_o = -\frac{1}{RC}\int_0^t E_1 dt + E_o(0)$
$E_o = (-1/Cp)(1/R)E_1 + E_o(0)$
$E_o = -RC\frac{dE_1}{dt}$
$E_o = (-R)(Cp)E_1$

For this literature circle **502** on inquiry card.

EMF/Pneumatic Transmitter

The EMF/Pneumatic Transmitter converts a d-c millivoltage measurement of temperature, speed, pH and many other variables to a proportional 3-15 psi pneumatic output signal . . . Receives a millivolt signal from the measuring element (thermocouple, tachometer, etc.), converts it by means of the magnettor circuit into a proportional 2000 cps a-c voltage, amplifies and filters the signal, and feeds it to a phase detector circuit. The resulting d-c output is passed through a temperature-stable resistor (R) and a transducer winding, connected in series.

Heart of the Transmitter is the transducer shown schematically . . . Standard Transmitters are available for measurement spans as narrow as 5 millivolts or as wide as 60 millivolts . . . (*From new 4-page Bulletin 20-16, The Foxboro Company, Foxboro, Mass.*)



For this literature circle **503** on inquiry card.

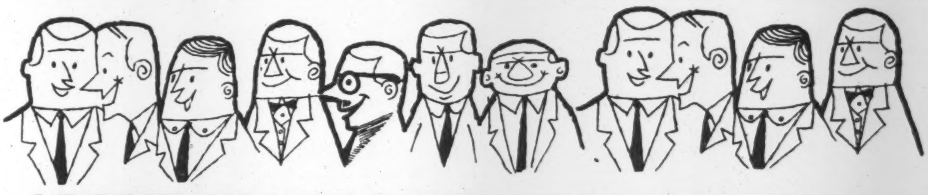
Conversion Tables

To convert ampere turns into Gilberts multiply by 1.257; to convert inches of mercury at 0°C into oz. per sq. inch, multiply by 0.5782. (*From new 28 x 22 inch wall chart with temperature conversion tables, decimal equivalents, electrical quantities, wire sizes for motor circuits, conversion tables, etc, Perkins Engineering Corp., 345 Kansas St., El Segundo, Calif.*)

ELECTRICAL QUANTITIES

Quantity	Symbol	Defining Equation	Units
Admittance	Y	$Y = I/\mho$	mho
Attenuation constant	α	$\alpha = \frac{1}{x}\ln\frac{E_0}{E}$	neper
Capacitance	C	$C = Q/\mho$	farad
Complex dielectric constant	ϵ^*	$\epsilon^* = \epsilon' - j\epsilon''$	farad/m
Complex index of refraction	n^*	$n^* = n(1 - jk)$	
Complex permeability	μ^*	$\mu^* = \mu' - j\mu''$	henry/m

For this literature circle **504** on inquiry card.



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Exposition

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PRODUCTION QUANTITIES IN STOCK • FAST DELIVERY FROM OUR STOCK

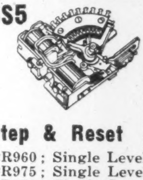
WESTON Model 705 SENSITROL

#R561

Stationary contact is a small powerful permanent magnet and movable contact is iron "rider" mounted on pointer which travels over relay scale. Operating torque moves pointer into magnetic field of stationary contact which draws movable contact and holds it firmly. Contacts remain closed until reset. Will operate directly from a photocell or a group of thermocouples. Net weight 14 oz.

Double contact with Solenoid Reset; Sensitivity 7.5 Microamps; Reset coil 6-24 VDC or 24 VAC; Makes contact on increasing or decreasing values; Contacts; "Twintacts", Capacity 100 ma at 110 volts; Nickel plated brass cover; Weston Model 705 Type 6 #R560 ..**18.75***
Same as #R560 but with glass face; Weston Model 705 Type 6 #R561 **19.75***
Single contact (Normally Open), Solenoid Reset; Sensitivity; 10 Microamperes; Reset coil; 6-24 V DC or 24 V AC; Contact: "Twintact", capacity 100 ma at 110 volts; Glass Face; Weston Model 705 Type 4 #R523 ......**17.75***
Same as #523 with Brass Cover Weston Model 705 Type 4 #R523N **16.75***

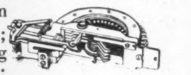
STEPPING SWITCHES



SS5 Mfd. by Western Electric Minor Switch 10 steps and off Contacts: #'s R960, 975, 976 **Gold** plated brass; Bridging Wiper; others non-bridging; Net. Wt. 1 lb.

Step & Reset

	Each*
#R960; Single Level; 6 to 12 VDC	9.50
#R975; Single Level; 24 to 36 VDC	10.50
#R976; Single Level; 48 to 60 VDC	11.50
#R643; Single Level; 100 to 125 VDC	12.50
#R977; Two Level; 6 to 12 VDC	10.50
#R978; Two Level; 24 to 36 VDC	11.50
#R979; Two Level; 48 to 60 VDC	12.50
#R644; Two Level; 100 to 125 VDC	13.50
#R642; Three Level; 6 to 12 VDC	11.50
#R600; Three Level; 24 to 36 VDC	12.50
#R645; Three Level; 48 to 60 VDC	13.50
#646; Three Level; 100 to 125 VDC	14.50



SS6 Mfd. by Western Electric Co.; 22 step; 5 levels; Bridging Wipers; Contacts; Gold plated brass. Interrupter Switch: 1 Break-Make; Net Weight: 2 lb. 2 oz.

"Homing" Type; 180° Wipers; Step in One Direction

	Each*
#R926; 6 to 12 VDC	13.75
#R980; 24 to 36 VDC	14.75
#R981; 48 to 60 VDC	15.75
#R615; 90 to 120 VDC	16.75

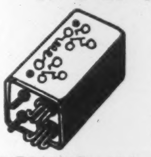
SS7 Mfd. by Western Electric Co.; 44 step; 2 Levels; Bridging Wipers; Contacts: Gold plated brass; Interrupter Switch; 1 Break-Make; Net Weight 1 lb. 14 oz.

"Homing" Type; 360° Wipers; Step in One Direction

	Each*
#R927; 6 to 12 VDC	**13.75**
#R982; 24 to 36 VDC	**14.75**
#R983; 48 to 60 VDC	**15.75**
#R616; 90 to 120 VDC	**16.75**

CLARE TYPE 20 "Homing" type; Step in one direction; 20 position; 180° wipers, one bridging and remainder non-bridging; Interrupter Switch: 1 break. #R891; 24-36VDC; 3 levels; Clare #SD19 **12.95 each**

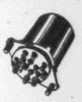
LATEST HERMETICALLY SEALED SUBMINIATURE TYPES SIGMA 22RJ SP & DP SENSITIVE TYPES



Light weight; Extremely small; Hermetically sealed in solder dipped brass can; 3 oz max weight. Silver contacts rated at 2 amp; solder lug connections.

22RJA200G: 10.0 ma operate, 3.5 ma release; 1A; 200 ohm; #R618 .... **7.50* ea**
22RJCC5000G: 2.8 ma operate, 1.0 ma release; 2C; 5000 ohm; #R619 .... **9.50 ea**
22RJCC8000G: 2.3 ma operate, 0.8 ma release; 2C; 8000 ohm; #R617 .... **9.50* ea**

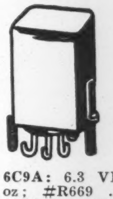
ALLIED 50G MH MULTIPOLE TYPES



Developed to meet spec MIL-R-575A; 18-30VDC; Hermetically sealed; −55°C to +85°C; 50G for 11 milliseconds. Contact rating 2 amp. Solder lug connections.

MH18DT: 26.5 VDC; 6PDT (6C); 240 ohm; 4.2 oz; Operate time: 8 millisec, release: 5 millisec. Mounting plate opposite terminals; #R647 .... **7.50* ea**
MH18D: Same as R647 above but mounting plate on same side as terminals (As illustrated); #R648 .... **7.50* ea**
MH12D: 26.5 VDC; 4PDT (4C); 300 ohm; 2.9 oz; Operate time: 7 millisec, release: 5 millisec; #R649 .... **7.00 ea**
MH6D: 26.5 VDC; DPDT (2C); 400 ohm; 1.2 oz; Operate time: 6 millisec, release: 5 millisec; #R665 .... **6.00 ea**
STRUTHERS DUNN 220XFX100; (Similar to Allied MH18D); 26.5 VDC; 6PDT(6C); 240 ohm; 3 oz; #R1145 .... **7.50* ea**

FILTORS, INC.



Developed to meet spec MIL-R-5757B; 4 to 9 VDC. Hermetically sealed; −65°C to +125°C; 50G for 11 millisec; contact rating 3 amp. Solder lug connections.

6C9A: 6.3 VDC; 3PDT(3C); 42 ohm; 2.6 oz; #R669 .... **6.50 ea***
26SA12A: Developed to meet spec MIL-R-575A; same as Allied MH12D; 26.5VDC; 4PDT(4C); 250 ohm; 2.2 oz; solder lug header; #R670 .... **7.00 ea***

*Prices shown with asterisk (*) are subject to quantity discounts listed above.

We are Exhibiting at Booth 121

Prices listed with asterisk (*) are subject to

QUANTITY DISCOUNTS		
	1-9	as quoted
	10-49	10%
	50-99	15%
	over 100	20%

ADVANCE F & S SERIES

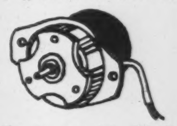
Light weight; compact; versatile relays for multitude of applications.

F2A C8726-1; 9.5VDC; SPDT(1C); 200 ohms; Solder lug header; #R666 ......**5.95 ea**
F2A C8727-1; 18-30VDC; DPDT(2C); 500 ohm; Solder lug header; #R664 .... **5.95 ea**
S2A D8701-1; 48VDC; DPDT(2C); 2000 ohms; Solder lug header; #R667 .... **5.95 ea**
S2A C8720-1K; 28VDC; SPDT(1C); 500 ohms; Solder lug header; #R668 .... **5.95 ea**

POTTER BRUMFIELD

SM5LS; 3 ma; SPDT(1C); 10,000 ohm; ¾" Dia x 1¾" H. Fits standard 7-pin miniature tube socket; #R1008 .... **3.95 ea**

MAGNETIC CLUTCH



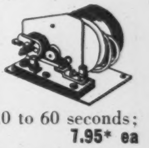
Double acting magnetic clutch; rated for operation on 24VDC; 125 ohms; 200 ma. Pulls in at 18 VDC, drops out at 5 VDC. Tooth clutch assures positive coupling. Torque capacity 12 in-lbs. An extra output shaft and a concentric flange are engaged with power off. When power is applied, flange disengages and shaft can rotate freely while coupling engages shafts through the unit. Flange can thus be used as a quick acting brake on output shaft.

Of ball-bearing construction, can operate at high speed. Suited for precision use as backlash and play are zero. Stainless steel output shaft 3/16 dia. x ½" long. Bronze input shaft 5/16 dia. x ⅜" long. Concentric flange, 1⅝ dia. x 3/16" thick with 3 equally spaced tapped holes for coupling. Aluminum body 1⅞ dia. x 2" long, exclusive of shafts. Mounting flange at output end. Shipping Wt., each 5 lb.
#MC101 ....**6.50* ea**

GEARS

Bronze Gear For Input Shaft 1⅝D 80 teeth #G101 **.35* ea**
Bronze Gear For Flange 3¼D 144 teeth #G102 **.60* ea**
Stainless Steel Gear For Output Shaft 1"D 48 teeth #G103 **.30* ea**
*See quantity discounts above

KURMAN TIME DELAY



R-308, motor driven 110 V 60 cycles; continuously adjustable delay 10 to 60 seconds; SPST (1A); #R671 **7.95* ea**

ALL MERCHANDISE IS GUARANTEED AND MAY BE RETURNED FOR FULL CREDIT.

SEND FOR LATEST CIRCULAR. TERMS:—All Prices F.O.B. Our Plant Rated Firms Net 10 Days; All Others Remittance with Order. Orders Under $10.00 Remittance with Order, Plus Approximate Shipping Charges (Overage Will be Returned).

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324 CANAL ST., N.Y.C., 13, N.Y. WAlker 5-9642

Universal general corp.

For more information circle **171** on inquiry card.

TIME YOUR TESTS IN SPLIT-SECONDS!

GRA LAB

ALL PURPOSE LABORATORY TIMERS

MODELS AT $21.95 TO $26.95

You can set the large 8" dial for any desired time period within an unusually wide range of 3600 possible settings, (ie., 1 sec. to 60 min., 1 min. to 60 hrs., etc.). At end of preset interval, alarm sounds and external load is automatically switched on or off.

Gra-Lab Micro Timers, **Electric Stop Clocks,** are available in 1/10 sec. or 1/1000 min. graduations for split-second measurements of elapsed time in laboratory or production operations. Price $37.50

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DIMCO-GRAY COMPANY

212 E. Sixth St.
DAYTON 2, OHIO

For more information circle **172** on inquiry card.

cleaned and back at work in 5 minutes

Waukee

FLO·METER

The Waukee FLO-METER can be cleaned and back in operation in five minutes *or less!* Saves time and money.

Inherent accuracy of the FLO-METER is protected by Waukee's design for fast, easy cleaning. No tools are needed. Production interruption at a minimum.

The Waukee FLO-METER also features: built-in Control Valves, panel mounting, simple piping, large 6″ and 9″ scales for ease of reading. Capacities 3 CFH to 10,000 CFH.

Complete information in Bulletin 203. Write for it. **Waukee Engineering Company,** 5137 North 35th Street, Milwaukee 9, Wisconsin.

For measuring: air — ammonia — dissociated ammonia — argon — butane — city gas — endothermic cracked — exothermic cracked — forming gas — helium — hydrogen — natural gas — nitrogen — oxygen — propane.

Waukee FLO-METERS • AIR-GAS MIXORS INDUSTRIAL WASHING MACHINES

For more information circle **173** on inquiry card.

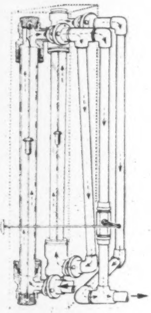
BRIEFS—CONTINUED

Gravity Anomaly Simulator

Mathematically, using Lambert's cosine law, it may be shown that the light integral for a horizontal layer has the same form as the gravitational integral for the same layer. By suitably scaling down all dimensions of the layer in the gravitational case, we can form a luminous surface of the same shape and perform the integration by simply measuring the illumination . . . An opaque slide of paper having an opening in the outline of the desired body is placed over a light source. The light reading is shown on a meter and combined with a multiplicative factor in determining the gravitational anomaly . . . (*From new 2-page Bulletin No. GM-203, Houston Technical Laboratories,* 2424 *Branard, Houston* 6, *Texas.*)

For this literature circle **505** on inquiry card.

Multi-Stage Flowrator Meter



The F&P Figure 164 Multi-Stage Flowrator Meter is a high-accuracy, wide range, variable-area flowmeter. It has been designed for precise flow measurement and evaluation of aircraft and automotive components . . . Flow measurement of from 5 to 100,000 pounds per hour is accomplished with a low pressure loss and an accuracy of ±½ of 1% of flow rate . . . (*From new* 8-*page Catalog* 10-*A*-34, *Fischer & Porter Co., Hatboro, Pa.*)

For this literature circle **506** on inquiry card.

INSTRUMENTATION ENGINEER

There are a few select positions in General Electric's Small Aircraft Engine Department for well qualified engineers who are at home in the areas of instrumentation development. At the same time they must be able to take the initiative in developing new and higher standards.

A thorough knowledge of laboratory experimentation instruments is required and the ability to apply these in measuring aerodynamic flow, vibration, etc. One activity involves the development of general instrumentation; the other is the application of instruments to the testing of engines and engine components.

Work is in advanced areas where individual achievement is quickly recognized and rewarded. Starting salaries are high and are coupled with an outstanding benefits program. The location near Boston is well known as a cultural center.

For futher information write, giving details of education and experience in confidence to:

Mr. T. S. Woerz (Section 6-B)

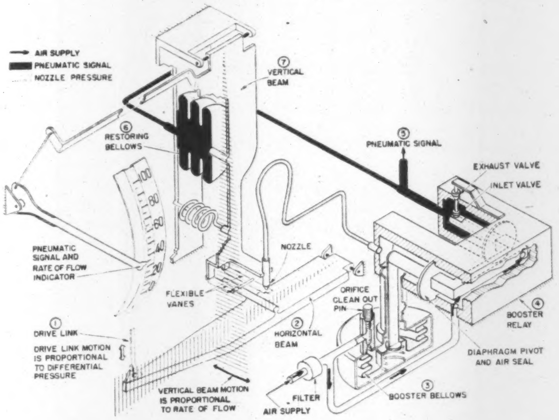
SMALL AIRCRAFT ENGINE DEPARTMENT

GENERAL ELECTRIC

1000 Western Avenue, West Lynn, Mass.

Flow Transmitter

The Bailey Flow Transmitter extracts the square root of flow differential measurements to produce a pneumatic signal proportional to rate of flow; transmits to indicating, recording, integrating, and/or controlling equipment at remote stations . . . For the measurement and transmission of rate of flow of liquids and gases producing standard differential pressure ranges from 0-50 to 0-1200 in. H_2O under service pressures from 800 to 6000 psig.


AIR SUPPLY
PNEUMATIC SIGNAL
NOZZLE PRESSURE
⑦ VERTICAL BEAM
⑥ RESTORING BELLOWS
⑤ PNEUMATIC SIGNAL
EXHAUST VALVE
INLET VALVE
100
80
60
40
20
PNEUMATIC SIGNAL AND RATE OF FLOW INDICATOR
NOZZLE
FLEXIBLE VANES
ORIFICE CLEAN OUT PIN
④ BOOSTER RELAY
① DRIVE LINK
DRIVE LINK MOTION IS PROPORTIONAL TO DIFFERENTIAL PRESSURE
② HORIZONTAL BEAM
DIAPHRAGM PIVOT AND AIR SEAL
VERTICAL BEAM MOTION IS PROPORTIONAL TO RATE OF FLOW
FILTER
AIR SUPPLY
③ BOOSTER BELLOWS

Input link (1) moves horizontal beam (2). Resulting change in vane-nozzle relationship causes change in booster bellows (3), thus activating booster relay (4), Pneumatic signal (5) produced by booster relay is also applied to restoring bellows (6) to reposition vertical beam (7) to restore original vane-nozzle relationship . . . *(From new 6-page Product Specification P22-6, Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio.)*

For this literature circle **507** on inquiry card.

What do you want to know about

AUTOMATIC PRODUCTION, ASSEMBLY, CLEANING AND FABRICATION?

You can learn about . . .

Automatic work positioning, drilling, machining—a frontier of automation—learn how to apply it to your machine tools.
Presented by Hillyer Instrument Co., in Room 520
"Digimatic" control systems for machine tools—featuring tape-recorded control data.
Presented by Electronic Control Systems, Inc., in Room 507
Special and standard gaging and control systems and components for machine tools.
Presented by Airborne Instruments Labs., in Room 302
Automatic transfer machines, conveying equipment and automatic production machines.
Presented by Aard Equipment Company, in Room 405
COC (Centralized Operations Control) systems built up from COC subsystem elements—many practical examples.
Presented by Hammarlund Manufacturing Co., in Room 551
Automatic transfer and conveying equipment—automatic warehousing.
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Work center systems for efficient production and assembly.
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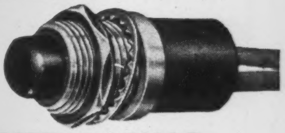
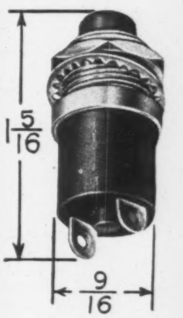
Dust control for precision assembly—sterile atmospheres.
Presented by Baker Company, Inc., in Room 408
Ultrasonic techniques for cleaning, gaging, inspection.
Presented by Branson Ultrasonic Corp., in Room 548
Component cleaning—with live demonstrations of automatic cleaning equipment.
Presented by Cobehn, Inc., in Room 531
Automatic control units for positioning of machine tools with tape, card or pre-set programming.
Presented by Warner & Swasey Research Corp., in Room 443

at the CLINIC FOR AUTOMATIC PRODUCTION, ASSEMBLY, CLEANING and FABRICATION at the Third Automation Exposition. See page 1970 for registration coupon.

MONEY SAVING
Push-Button
SWITCHES



...U.L. APPROVED RATING
8—AMPS., 115 volts, ac.



Dress-up instruments, appliances and countless other products with a switch that "feels" and performs like a true Snap-Switch should. Hetherington B-Series push button switches have an exceptionally positive, audible snap action that can't be teased off contact . . . allows full 8-ampere rating in less space than most ½-amp switches. Normally-open or normally-closed SP-ST types available with pigtail leads or lug terminals.

Get complete details. Write for Data Sheet S-4.

Push-button, Rotary, & Toggle Switches
Indicator Lights
Switch-Light combinations

HETHERINGTON INC.
1200 Elmwood Avenue, Sharon Hill, Pa.

For more information circle **174** on inquiry card.

TEST FOR CARBON IN JUST 2 MINUTES *with a DIETERT-DETROIT carbon determinator*

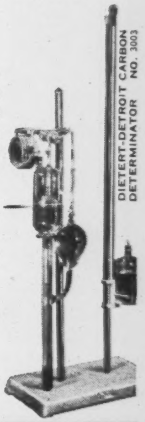
Why bother with tedious, time consuming laboratory routines when a Dietert-Detroit Carbon Determinator provides a completely accurate analysis of carbon content in just two minutes. Easy, too . . . no involved computations! Samples may be borings, mill chips, crushed samples, pellets, etc.

Sulfur Determinators also available for performing fast, accurate tests on wide range of materials.

Excellent performance record with:

IRON / STEEL / PETROLEUM CATALYSTS
STAINLESS ALLOYS / ORGANIC CHEMICALS
FOUNDRY SANDS

Send for free catalog!
Illustrates and describes both Carbon and Sulfur Determinators and accessory equipment.


DIETERT-DETROIT CARBON DETERMINATOR NO. 3003

HARRY W. DIETERT CO. **CONTROL EQUIPMENT**
9330 ROSELAWN **DETROIT 4, MICH.**
Send me your latest Carbon-Sulfur Determinator Catalog.
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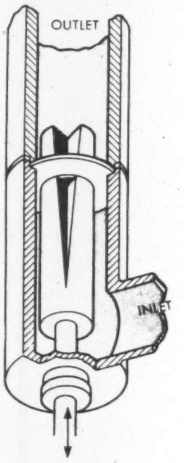
For more information circle **175** on inquiry card.

V-Notch Chlorinator



The W&T V-Notch Variable-Orifice is the heart of the control system of the Series A-712 chlorinator. The flow of chlorine gas is adjusted by varying the area of the V-notch Variable-Orifice while maintaining a constant differential across the orifice . . . The V-notch Variable-Orifice control system will maintain the set feed rate within 4% on all flows within the 20 to 1 calibrated range . . . Automatic operation is accomplished by automatically positioning the V-notch plug within the ring to change the size of the V-notch Variable-Orifice in proportion to a control signal. Auxiliary positioning equipment which converts signals from a primary meter, program timer, or step-rate controller is mounted inside the chlorinator housing . . . (*From new 8-page Catalog File No. 25.110, Wallace & Tiernan, Inc., 25 Main St., Belleville 9, N. J.*)

For this literature circle **508** on inquiry card.

Level Trols

The important point to remember in understanding the operation of the Level-Trol is that the float, regardless of shape or size, must always be heavier than the liquid it displaces . . . The displacement type float provides a most satisfactory method for measuring the level and all that remains is to translate the buoyant force to a

NEW
HI-VOLUME
AIR SAMPLER

accurately samples the air for radioactive material, particulate matter, etc.

Hundreds used in Atomic Energy tests, and by Industries employing, developing and manufacturing nuclear products . . . Literally "inhales" an entire area with unparalleled speed and accuracy . . . Particles as small as 1/100th a micron in diameter have been accurately sampled by this unit . . . Portable . . . Designed for indoor and outdoor use . . . Indispensable for series or unit tests. 24 V, 110 V, & 220 V models available.

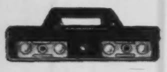
For details about this new scientific method

THE Staplex CO.
AIR SAMPLER DIVISION
784—5th Ave., Brooklyn 32, N. Y.

For more information circle **176** on inquiry card.

The Finest Electrical Contacts
AT THE LOWEST QUANTITY PRICE

AUTOMOBILE SWITCH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D. E. Makepeace, over 50 years a leader in the bonding of precious metals to base metals, offers to the electrical industry a line of quality contacts at mass produced prices for exceptional economy. The raised lay and spot lay contacts illustrated are typical for scores of special applications produced to rigid specifications. We'd like to help you design for outstanding performance with remarkable economy.

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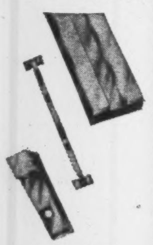
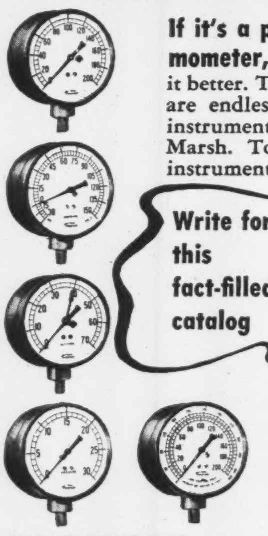

RAISED LAY

Makepeace
D. E. MAKEPEACE COMPANY
Division of
Union Plate and Wire Co.
Attleboro, Mass.

ENGELHARD INDUSTRIES

For more information circle **177** on inquiry card.

MARSH MAKES IT!



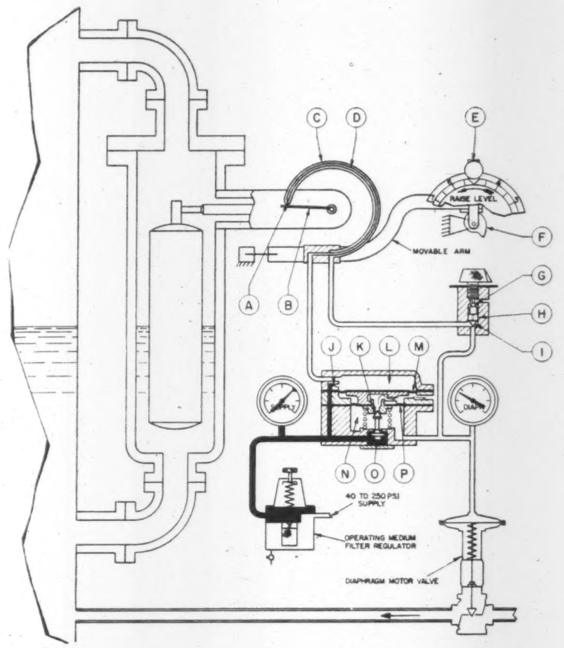
If it's a pressure gauge or dial thermometer, Marsh makes it . . . and makes it better. The types, ranges and case styles are endless. What is "special" to other instrument makers is often standard to Marsh. To know the scope of Marsh instruments—

Write for this fact-filled catalog

MARSH
Gauges Thermometers
catalog no.
UO-m

MARSH INSTRUMENT CO.,
Sales affiliate of Jas. P. Marsh Corporation,
Dept. 42, Skokie, Ill. ***Export Dept.,*** **3501 Howard St., Skokie, Ill.**
Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alta.

For more information circle **178** on inquiry card.



pneumatic signal that will be directly proportional to level position . . . The ratio of the two diaphragm areas ("M" and "P") in the relay is 3 to 1, or such that 5 pounds change on large diaphragm "M" results in a 15-pound change in pressure to the diaphragm control valve . . . (*From new 32-page Bulletin F-4, Fisher Governor Co., Marshalltown, Iowa*)

For this literature circle **509** on inquiry card.

SYSTEMS ENGINEERING

Openings now exist at BATTELLE in the following areas:

MATHEMATICAL and STATISTICAL ANALYSIS
DIGITAL and ANALOG COMPUTER PROGRAMMING and PROBLEMS ANALYSIS
THEORETICAL PHYSICS
NUCLEAR REACTOR POWER SYSTEM CONTROL
CONTROL SYSTEMS ANALYSIS

Employment on Battelle's Systems Engineering staff assures an opportunity to engage in an activity of a professional nature. Advanced degrees are obtainable, at no cost to the staff member, through BATTELLE'S TECHNICAL EDUCATIONAL PROGRAM. OUTSTANDING BENEFIT PROGRAM including FOUR WEEKS VACATION after only five years employment offered by this research organization employing 3,000, two-thirds of whom are engaged directly in the research effort.

For descriptive material and technical application form, write to

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FOR TESTING FABRICS THAT MUST HOLD GAS

The Cambridge Fabric Permeameter is an accurate, rugged and convenient instrument for production testing of the permeability of fabrics which are to be inflated with Hydrogen, Helium, Carbon Dioxide, etc.

The rate of permeation through the fabric is quickly determined by equipment utilizing the thermal conductivity method and is indicated in terms of liters per square meter per 24 hours of the retained gas.

Manufacturers of fabrics for lighter-than-air Craft, Life Rafts, Life Jackets, Gas Masks, etc., will find this an indispensable instrument. Send for particulars.

CAMBRIDGE INSTRUMENT CO., INC.
3526 Grand Terminal, New York, N.Y.

CAMBRIDGE FABRIC PERMEAMETER

For more information circle **179** on inquiry card.

DC-AC CHOPPER
STEVENS-ARNOLD INC
SOUTH BOSTON, MASS.
S/A-10

DC-AC CHOPPERS

For 60 Cycle Use

Built to rigid commercial specifications.
Twenty-two types, both single and double pole.
Long life.
Low noise level.
Extreme reliability.
Write for Catalog 370.

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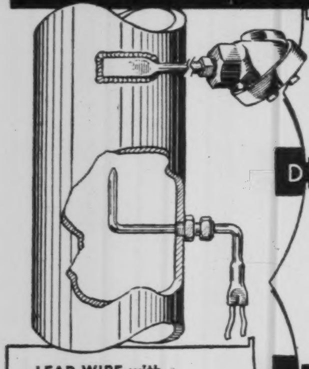
22 ELKINS STREET
SOUTH BOSTON 27, MASS.

For more information circle **180** on inquiry card.

*SWAGED MGO
FOR OPERATING TEMPERATURES −300 to 2000°F
INSULATED THERMOCOUPLES



SURFACE with STANDARD T/C Head
- Extremely accurate since junction can be welded to surface.

DESIGNING

IMMERSION with LEAD WIRE ADAPTOR
- Fast time response
- Install in any pipeline without a thermo-well by simply drilling and tapping.
- Pressure and vacuum tight.
- Variable immersion depth —easily replaced.

LEAD WIRE with QUICK DISCONNECT
- Available in long lengths or spliced together to meet your length requirements.

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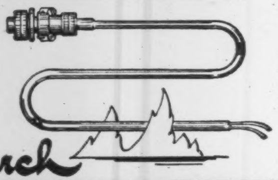


*SWAGED MgO wire is available from our stock—Diam. .025 to 5/16". SEND FOR BULLETIN 4.

Aero Research
INSTRUMENT COMPANY, INC.
315 NO. ABERDEEN STREET, CHICAGO 7, ILLINOIS
Sales Representatives throughout the United States and Canada

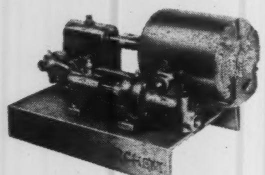
For more information circle **181** on inquiry card.

INTRODUCING
the
"ORCHEM MITY-MITE"
PROPORTIONING PUMP

Recommended particularly for low volume, boiler chemical feed applications. Excellent for many chemical process metering requirements.

Adjustable from 0 to 100% of capacity. No springs to retard self-cleaning of checks. Accessibility without breaking pipe connections.

SIMPLEX with ⅓ H.P. motor
$\$155^{00}$ F.O.B. Phila.



DUPLEX with ⅓ H.P. motor
$\$198^{00}$ F.O.B. Phila.

Plunger Diameter	RPM	Capacity		Maximum Pressure
		Simplex	Duplex	
7/16	70	3 GPH	6 GPH	610 PSI
5/8	70	6 GPH	12 GPH	325 PSI

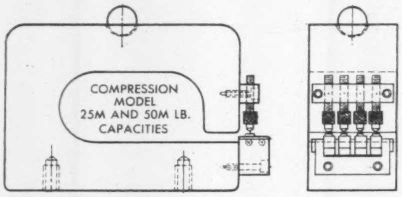
WRITE FOR BULLETIN 8-56-1
ORCHEM PUMPS, INC.
Controlled Volume Chemical Pumps
4434-36 SALMON STREET PHILADELPHIA 37, PENNA.

For more information circle **182** on inquiry card.

BRIEFS—CONTINUED

Force Control Switch

Operation of the DILLON Force Control Switch centers around a "U" shaped beam which, when compressed at ball contact, deflects inwardly. As many as four control switches may be mounted on one side of the open end . . . Describing a typical setup, it might be necessary to trigger a series of devices at 200, 450, 650 and 900 pounds . . . (*From new 4-page Bulletin 28E, W. C. Dillon Company, Inc., 14620 Keswick St., Van Nuys, Calif.*)

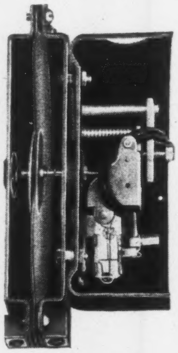


For this literature circle **510** on inquiry card.

Electrocaloric Flowmeter

This new, accurate device is especially suitable for measuring, recording and controlling acids and alkalis (HCL, HF, NAOH, KOH, etc.), explosive fluids (gasoline), inflammable gases (manufactured and natural gases, etc.) and slurries . . . The Flow Cell measuring elements are not in contact with the fluid and, therefore, are not exposed to chemical and mechanical attack or subject to clogging.

Flowmeter accurately measures and totalizes the mass rate of flow by measuring the rate of heat transfer



CROSS SECTION

DIFFERENTIAL
PRESSURE
CONTROL
FOR AIR OR GAS (INCHES OR HUNDREDTHS OF INCHES OF WATER)

Incorporates two pressure chambers separated by a diaphragm. Opens or closes an electrical circuit according to a minute change in the difference between two pressures or vacuums.

Suggested application: Indicate a change in resistance through a filter due to a clogging of the filter—indicate a change in differential across an orifice due to a change in flow conditions—indicate an unbalanced condition of two air ducts.

Operating ranges: 6.0" vac. to 6.0" press., and 30.0" vac. to 30.0" press.

AVAILABLE IN FOUR MODELS

To open or close an electrical circuit upon an increase or decrease in the difference between two gas or air pressures.

To successively open or close two electrical circuits upon an increase or decrease in difference between two air or gas pressures.

To close one circuit on an increase of the difference between two pressures and close one circuit on a decrease of the difference between two pressures.

To open one circuit on an increase of the difference between two pressures and open one circuit on a decrease of the difference between two pressures.

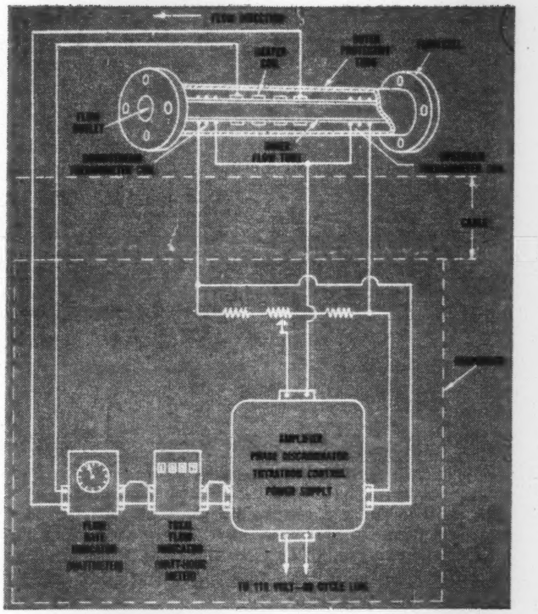
FOR ALL TYPES OF SERVICE

For General Purpose Nema 1; Weatherproof Nema 1A, 2, 3, 4; Explosion-proof (Hazardous Locations) Class 1 Group D, Class 2, Group E, F and G.

Equipped with the famous Mercoid magnetic sealed mercury contact.

WRITE FOR BULLETIN CA-3P
THE MERCOID CORPORATION
4201 BELMONT AVE., CHICAGO 41, ILLINOIS

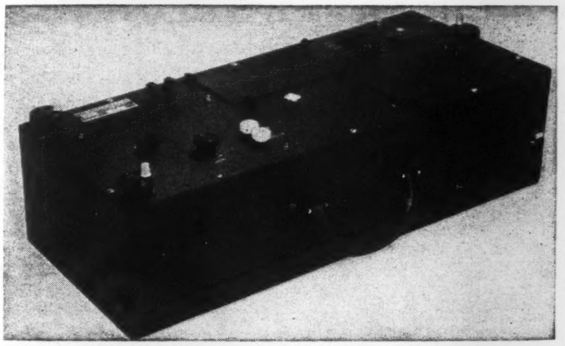
For more information circle **183** on inquiry card.



through the boundary layer of fluid . . . Heat is produced electrically in the heater coil, wound around outside of flow tube. The differential is a function of both the fluid mass flow rate and the power dissipated in the heater coil . . . (*From new 4-page bulletin "Laub Electro-Caloric Flowmeter," Industrial Development Laboratories, Inc., 17 Pollock Ave., Jersey City 5, N. J.*)

For this literature circle **511** on inquiry card.

NEW! . . . Portable
BLAST and VIBRATION SEISMOGRAPH
by Sprengnether



KEEP YOUR OWN PERMANENT RECORDS!

Features:
- Three Components
- Completely self-Contained
- Portable
- Transient or Steady-State Vibrations in the Seismic Frequency Range
- Rugged-Dependable
- Custom Designed to the User's Requirements

Entire instrument is self-contained in rigid aluminum case -25 x 10 x 8 inches Uses basic seismometer system. The three components are adjusted to 0.75 second. Timing lines are placed across record at 0.02 second. Instrument operates to give accurate record of displacement of ground as vibrations pass recording site.

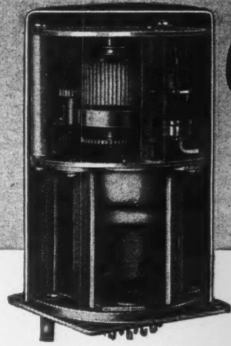
Interpretation service available by engineering seismologists.

Send for Free Data Folder.

W. F. SPRENGNETHER INSTRUMENT CO. INC.

W. F.
SPRENGNETHER
INSTRUMENT CO., INC.,
4567 SWAN AVE., ST. LOUIS, MO.
Mfrs. of Seismological, Geophysical Instruments

For more information circle **184** on inquiry card.



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SPECIAL SERVICE CONDITIONS?

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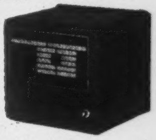
HERMETICALLY SEALED

- TIME DELAY RELAYS
- CYCLING TIMERS
- CIRCUIT RECLOSING RELAYS



- Meet stringent military specifications.
- High accuracy. Long service life.
- Available 50, 60, 400-cycle to 250V AC; 6-30V DC.
- Small size. Precision built.
- Individually timed and tested.
- Send for comprehensive technical Bulletin PB-410.

CRAMER CONTROLS
CORPORATION
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For more information circle **185** on inquiry card.

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Sports and Industry have relied on Racine for fine TIMERS

Available at Scientific Supply Firms. If unobtainable locally, write us.

Chronographs and Special Timers in All Price Ranges

Write for Latest CATALOG Featuring GALLET Timers

Wherever Accuracy Counts!

JULES RACINE & COMPANY, INC.
Specialists in Fine Timers — Since 1890
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For more information circle **186** on inquiry card.

POWER OSCILLATOR
MODEL 1040

PRICE $119.00 F.O.B. NEW YORK

A COMPACT PRECISION OSCILLATOR PROVIDING 3 WATTS OUTPUT

- Excellent Accuracy and Stability
- Transformer Isolated Output
- 3 Output Impedances
- Low Internal Impedance
- Output Variable Up To 120 Volts

SPECIFICATIONS

Frequencies	400 or 1000 C.P.S. by selector switch (other frequencies on request)
Distortion	Less than 1%
Hum Level	Approximately .05% of rated output
Output Power	3 watts into matched resistive load
Power Supply	115 volts, 60 C.P.S., 40 watts
Dimensions	5-11/16 x 9 x 6⅛ inches

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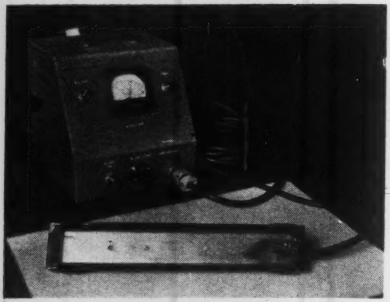
55 EAST 11th STREET • NEW YORK 3, N. Y.

For more information circle 187 on inquiry card.

TRULINE PROCESS CO.
2235 Chouteau Ave., St. Louis 3, Mo.



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*Electro Photographic Equipment and Materials**

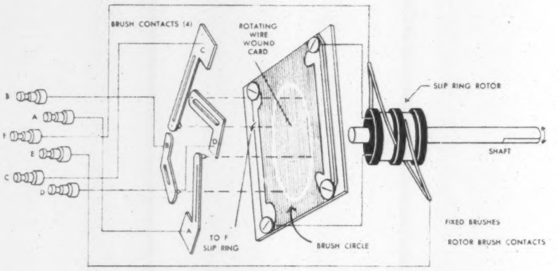
*See article on ELECTRON PHOTOGRAPHY in this issue.

For more information circle 188 on inquiry card.

BRIEFS—CONTINUED

Sine-Cosine Potentiometers

If a point contact is caused to move in a circular path over the face of a rectangular card wound with straight, parallel, uniformly spaced, current-carrying wires, the potential between the contact and any fixed point of the winding will vary in a sinusoidal manner with respect to angular rotation . . . (*From new 20-page Catalog "Precision Potentiometers," The Gamewell Co., Newton Upper Falls, Mass.*)



For this literature circle **512** on inquiry card.

Magnetic Field Control System

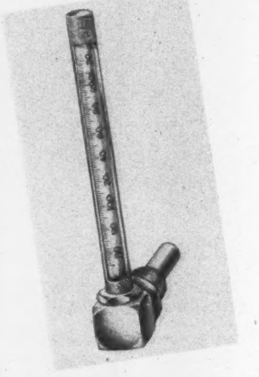
The NUMAR Model C-1 Magnetic Field Control System is designed to be used in the automatic control of electromagnets. The C-1 consists of three interconnected units: (1) probe, (2) oscillator, and (3) console, containing a power supply, lock-in amplifier and modulator. The probe,

Standardize on Easy-to-Read

YEL O BAK
Reg. U. S. Pat. Office

FLAT BORE ENGRAVED STEM

MIDGET INDUSTRIAL THERMOMETERS



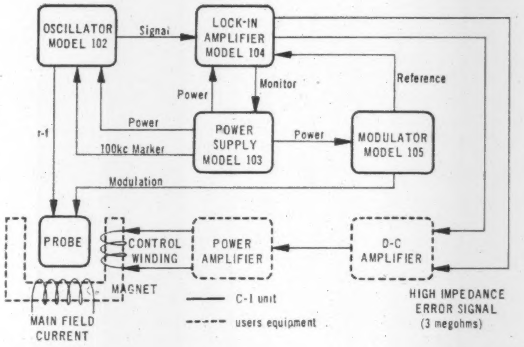
★ **ACCURATE**—to within a fraction of a degree
★ **EASY - TO - READ**—board — flat — stripe — mercury column in a yellow stem
★ **ECONOMICAL**—replacement can be inserted on-the-job without difficulty
★ **ARMOUR PROTECTED**—to resist corrosion and dirt
★ **TWO TYPES**—angle and straight stem

ASICO
Reg. U. S. Pat. Off.

Write for CATALOG 25

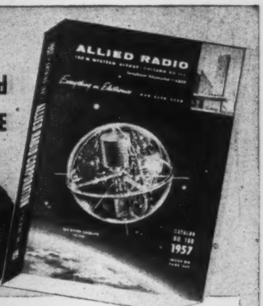
ACCURACY SCIENTIFIC INSTRUMENT CO.
2903 N. 12th STREET
PHILADELPHIA 33, PA.

For more information circle 189 on inquiry card.



containing sample material, is positioned within the magnetic field to be controlled. The sample material absorbs r-f energy at a particular resonant frequency which is determined by the strength of the magnetic field and the known gyromagnetic ratio of the sample material. The r-f energy is applied by means of a coil in the probe which surrounds the sample. The coil is connected by a cable to a tunable oscillator arranged to provide an indication of circuit losses in the coil such as are introduced by the r-f energy absorption in the sample at resonant frequency . . . The C-1 Control System will maintain the difference between the actual field and the reference field, established by the oscillator frequency, to one part in 10^5 or a tenth of a line width, whichever is greater . . . . Four color-coded probes are included to cover the gauss range from 300 to 18,750 gauss . . . (*From new 4-page bulletin "Magnetic Field Control System, Model C-1, Nuclear Magnetics Corp.,* 154 *Boylston St., Boston, Mass.*)

For this literature circle **513** on inquiry card.



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For more information circle **191** on inquiry card.

AGASTAT
AGA
5 7/16"

Staggered starting of electric motors...

AGASTAT
Time / Delay / Relay

AGASTAT allows you to stagger the starting of three motors without imposing their load on the line at the same time.

The AGASTAT is
- **electrically actuated, pneumatically timed.**
- **light, versatile, dependable.**
- **instantaneous recycling.**
- **adjustable in timing from 0.1 second to more than 10 minutes.**
- **available in AC or DC models which offer delays on energizing and de-energizing, manually-actuated time delay switch, remote push button control, hermetically-sealed units.**

Write our application engineers for help with your timing problem. Address Dept. A25-109

AGA DIVISION

Elastic Stop Nut Corporation of America

1027 Newark Avenue, Elizabeth, New Jersey
Pioneers in pneumatic timing.

For more information circle **190** on inquiry card.

Two New Ultrasonic Cleaners

GW-5
The Larger Unit

We are pleased to announce the finest ultrasonic ball bearing and small parts cleaner available, with fluid filtering and circulation. Can be combined with Sterilshield (dust-free) Work Cabinets to provide the ultimate in cleaning and clean environments. Chemical engineering service available to help select the best cleaning media for your application.

THE BAKER COMPANY, INC.
Maplewood, Maine
"If It Has A Bearing On Bearings"
See us at Booth 408 at the Third International Automation Exhibit

For more information circle **192** on inquiry card.

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WINS

with

EECO PLUG-INS

Every day more organizations are discovering the advantages of using EECO plug-in circuits in developing electronic equipment. Why not join this winners' circle and prove the advantages for yourself?

❀ Your engineers will be free to concentrate on the design of systems instead of routine circuit detail.

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❀ Your customers will enjoy the satisfaction of superior equipment, the convenience of easier maintenance.

All of which adds up to greater profits, increased customer prestige, and more orders for you.

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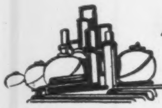
a subsidiary of
Electronic Engineering Company
of California
506 EAST FIRST STREET
SANTA ANA, CALIFORNIA

For more information circle **193** on inquiry card.

INSTRUMENTS and AUTOMATION New Literature



AUTOMATION

Operations Control. New 20-page bulletin presents applications of maker's equipment for new-product development, basic research, process monitoring and control, dynamic testing, vacuum technology, automatic data processing, etc.—Consolidated Electrodynamics Corp., 300 N. Sierra Madre Villa, Pasadena, Calif.

Circle **514** on inquiry card.

Systems Engineering. New 16-page Bulletin CEC-1304A describes operation and makeup of CEC's System Division. Presents several representative systems application problems along with their solutions—Consolidated Electrodynamics Corp., Systems Div., 300 N. Sierra Madre Villa, Pasadena, Calif.

Circle **515** on inquiry card.

Meters and Controls. New 8-page Bulletin G15-1 gives pictorial and descriptive review of maker's measuring, transmitting, receiving and recording instruments for power and process applications.—Bailey Meter Co., 1050 Ivanhoe Road, Cleveland 10, Ohio.

Circle **516** on inquiry card.

Electrical Transmitter. New 4-page Bulletin MYP-508 presents operation and maintenance of maker's ring balance electrical transmitter.—Hagan Corp., Pittsburgh 30, Penna.

Circle **517** on inquiry card.

Atomic Energy Plant Controls. New 8-page bulletin describes electro-hydraulic controls, heat transfer apparatus, remote television, servo systems and ceramics for application in atomic energy plants made by four subsidiary companies of General Precision Equipment Corp.—Advertising Dept., Askania Regulator Co., 240 E. Ontario St., Chicago 11, Ill.

Circle **518** on inquiry card.

Electronic Controllers. New 8-page Bulletin MYP-600 describes operation and maintenance of Model CAO and Model CPO electronic controllers for high performance and high-speed processes.—Hagan Corp. Pittsburgh 30, Pa.

Circle **519** on inquiry card.

Instruments and Gages. New 72-page catalog presents charts, diagrams and illustrations of maker's gages for measuring combustion, draft, pressure, flow, vacuum, CO_2, smoke, velocity, etc. and includes price list.—F. W. Dwyer Mfg. Co., P. O. Box 373, Michigan City, Ind.

Circle **520** on inquiry card.

Packaged Machine Control. New 12-page Bulletin GEA-6334 presents applications of "Pan-A-Trol" control panels and benefits in engineering assistance, design, installation, maintenance, etc. offered by company.—General Electric Co., Schenectady 5, N. Y.

Circle **521** on inquiry card.

Photoelectric Systems. New 24-page illustrated Brochure PA-561 presents specifications on maker's "packaged" photoelectric systems for industrial control applications.—Photoswitch Div., Electronics Corp. of America, One Memorial Drive, Cambridge 42, Mass.

Circle **522** on inquiry card.

Automatic Instrumentation Components. Six new 2-page bulletins in folder describe maker's automatic instrumentation components and systems.—Fairchild Electrotechnics Div., Fairchild Engine & Airplane Corp., 118 E. 16th St., Costa Mesa, Calif.

Circle **523** on inquiry card.

Industrial Instrumentation. New 4-page Bulletin F-403 pictures and describes maker's recording, indicating and controlling instruments for industrial processing.—Fielden Instrument Div., Robertshaw-Fulton Controls Co., 2920 N. Fourth St., Phila. 33, Pa.

Circle **524** on inquiry card.

Control Systems. New 16-page Bulletin 136 describes maker's pulse control systems for testing cores by digital techniques.—Burroughs Corp., Electronic Insts. Div., 1209 Vine St., Phila. 7, Pa.

Circle **525** on inquiry card.

Control Units. New 4-page illustrated brochure describes maker's "Cy-Co-Trol" tool control units.—Royal Design and Mfg., Inc., 4133 E. Ten Mile Rd., Center Line, Mich.

Circle **526** on inquiry card.

Remote Metering System. New 2-page bulletin describes maker's remote metering system for electronically monitoring any process variable.—Sparton Control Systems Div., Sparks-Withington Co., Jackson, Mich.

Circle **527** on inquiry card.

Process Control. New 12-page bulletin describes services available to process industries for specifying component sizes for an optimum system, calculating "payout" for new features or additional system complexity, etc. —Feedback Controls, Inc., Dept. IA, Waltham, Mass.

Circle **528** on inquiry card.

Control Unit. New 4-page Bulletin ST-1 describes maker's electronic—hydraulic control unit.—The Swiss Colony, Engineering Div., Monroe, Wis.

Circle **529** on inquiry card.

Excitation System. New 8-page Bulletin 5.08 describes maker's McHenry excitation system.—Electric Regulator Corp., Pearl St., Norwalk, Conn.
Circle **530** on inquiry card.

Systems Engineering. New 4-page Bulletin SE-1-000 presents systems engineering and analog computing services. 2-page Bulletin A-1-000 describes power amplifier; 2-page Bulletin SM-1-000 describes servos; 2-page specification sheets describes signal converter.—Dynalysis Development Laboratories, Inc., 11941 Wilshire Blvd., Los Angeles 25, Calif.
Circle **531** on inquiry card.

Magnetic Control. New 8-page Technical Data 52-760 describes maker's "Cypak" plug-in, magnetic control, logic functions for industrial control without moving parts or operating contacts.—Westinghouse Electric Corp., 401 Liberty Ave., Box 2278 Pittsburgh 30, Pa.
Circle **532** on inquiry card.

VALVES

Diaphragm Control Valve. New 4-page Bulletin 0-125P describes and illustrates maker's "Series 125P" high-pressure diaphragm control valve.—Fisher Governor Co., Marshalltown, Iowa.
Circle **533** on inquiry card.

Gas Regulators. New 4-page Bulletin P-67 presents maker's "Series 883 and 885" high-pressure gas regulator valves.—Fisher Governor Co., Marshalltown, Iowa.
Circle **534** on inquiry card.

Butterfly Valves. New Specification Sheet RM-1000 describes maker's line of V-Port butterfly valves for precise control of air or gas.—Hagan Corp., 323 Fourth Ave., Pittsburgh 22, Pa.
Circle **535** on inquiry card.

Sampling Valve. New 2-page Data Sheet 294 presents information on maker's drain or sampling valve. New 2-page Data Sheet 293 presents details of maker's gage glass cleaning rod.—Jerguson Gage & Valve Co., 80 Fellsway, Somerville 45, Mass.
Circle **536** on inquiry card.

Valves. New 140-page Catalog 55 describes and illustrates (in simulated blueprint form) in 7 sections company's reverse current, spring relief, atmospheric relief, non-lubricated plug, and pressure regulating valves and accessories, for power plant, industrial, marine and special devices. —Atwood & Morrill Co., Salem, Mass.
Circle **537** on inquiry card.

Hydraulic Valves. New 92-page Catalog describes and illustrates maker's oil hydraulic valves for controlling fluid power.—The Commercial Shearing and Stamping Co., 1775 Logan Ave., Youngstown 1, Ohio.
Circle **538** on inquiry card.

Globe Valves. New 4-page illustrated Bulletin 602-2 describes maker's "LQ600" bronze globe valves.—Lunkenheimer Co., Box 360, Cincinnati 14, Ohio.
Circle **539** on inquiry card.

Control Valves. New 8-page Catalog 56C pictures and describes maker's

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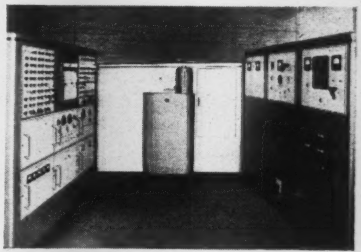

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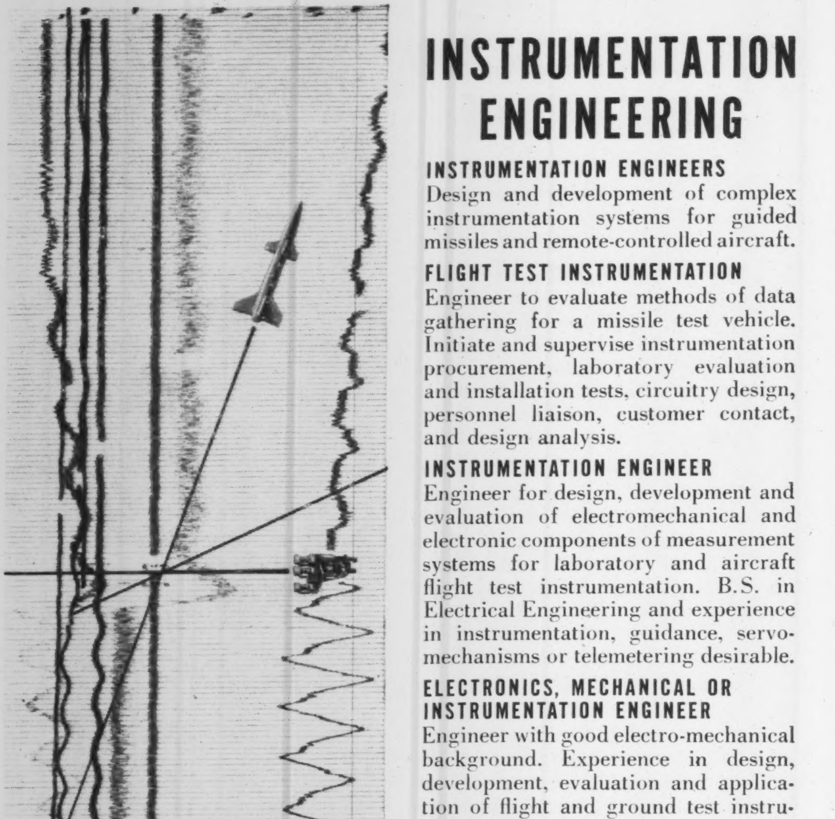

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automatic pressure, temperature and level control valves for process control.—Atlas Valve Co., 280 South St., Newark 5, N. J.

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MOTORS, SERVOS

Motors. New 11-page Bulletins GEC-1026A and GEC-1027A provide application data, ratings and prices for fractional hp motors, integral-hp polyphase and single-phase induction motors, gear-motors, etc.—General Electric Co., Schenectady 5, N. Y.

Circle **541** on inquiry card.

Servo Equipment. New 16-page Short-Form Catalog SF-9901-56 describes maker's equipment for industrial control systems, infrared measurement and control, communication and navigation.—Servo Corp. of America, 20-20 Jericho Turnpike, New Hyde Park, N. Y.

Circle **542** on inquiry card.

Electric Motors. New Bulletin AL-4 describes maker's FHP electric motors.—Redmond Co., Inc., Owosso, Mich.

Circle **543** on inquiry card.

Motor Capacitors. New 4-page Bulletin 179 presents maker's "Type KGN" a-c motor capacitors in rectangular fabricated cases.—Cornell-Dubilier Electric Corp., South Plainfield, N. J.

Circle **544** on inquiry card.

Micromotor. New 4-page Brochure AL-4 describes and illustrates maker's "Type AL-4 Tri-Flux" patented shaded pole micromotor.—Redmond Co., Inc., Owosso, Mich.

Circle **545** on inquiry card.

Fluid Drives. New 8-page illustrated Bulletin 9819 describes maker's 1 through 25 hp "Type VS-Class 2" Gyrol Adjustable speed fluid drives.—American Blower Corp., Hydraulic Coupling Div., Detroit 32, Mich.

Circle **546** on inquiry card.

TEMPERATURE

Thermistors. New 56-page Manual #TH-13A describes and illustrates maker's thermally sensitive resistors with characteristic curves.—General Electric, Metallurgical Products Dept., Detroit 32, Mich.

Circle **547** on inquiry card.

Thermocouple Protecting Tubes. New 2-page Bulletin 1000-56 describes and illustrates maker's "Serv-Rite" line of ceramic protecting tubes.—Claud S. Gordon Co., Chicago, Ill.

Circle **548** on inquiry card.

Thermocouple Insulators. New 4-page Bulletin 300-56 illustrates and describes maker's complete line of "Serv-Rite" thermocouple insulators.—Claud S. Gordon Co., 3000 S. Wallace St., Chicago 16, Ill.

Circle **549** on inquiry card.

Temperature Controls. New 4-page "Model TE" Bulletin RT-771 describes maker's Model TE "Thermal-Eye" temperature control device.—Robertshaw-Fulton Controls Co., 110 East Otterman St., Greensburg, Pa.
Circle **550** on inquiry card.

Temperature Control. New 4-page Bulletin RT-754 describes maker's Model BJ-TE "Thermal-Eye" temperature regulating device for gas top-burners.—Robertshaw-Fulton Controls Co., 110 East Otterman St., Greensburg, Pa.
Circle **551** on inquiry card.

Temperature Cabinets. New 4-page bulletin describes maker's hot and/or cold temperature cabinets for industrial applications from +300° F to -200° F. New 2-page Bulletin 62 describes sub-zero rivet coolers.—Webber Engineering Corp., P. O. Box 217, Indianapolis, Ind.
Circle **552** on inquiry card.

Self-ignition Apparatus. New 18-page Bulletin (Vol. 53, No. 1) features article on "Self-Ignition Temperatures of Combustible Liquids".—Research Appliance Co., Box 307, Allison Park, Pa.
Circle **553** on inquiry card.

Hydrometers, Thermometers. New 40-page Catalog 211 lists hydrometers and thermometers, including special and unusual ranges.—Wm. Hiergesell & Sons, 295 Pearl St., New York 38, N. Y.
Circle **554** on inquiry card.

PRESSURE, WEIGHT

Pressure Cells. New 2-page Bulletin 271 describes maker's "Celab" pressure cells.—Clark Electronic Labs., Box 165, Palm Springs, Calif.
Circle **555** on inquiry card.

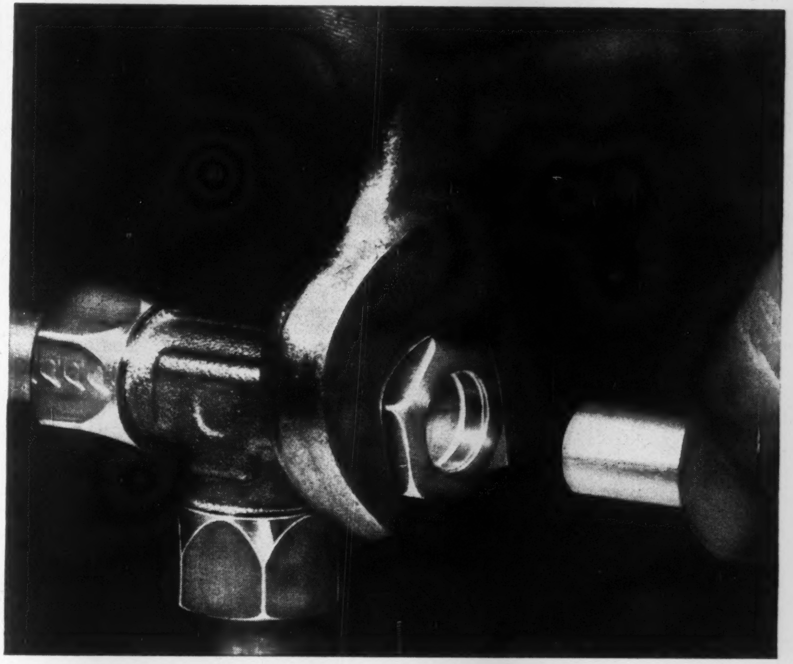
Pressure Transducers. Three new bulletins present models of maker's pressure transducer: 8-page bulletin presents "Model S-3"; and two 4-page bulletins cover "Models S-6A and S-6B".—Ultradyne Engineering Labs., Inc., P. O. Box 8007, Albuquerque, New Mexico.
Circle **556** on inquiry card.

Belt Conveyor Scale. New 6-page data sheets presents information on maker's unitized weighing belt conveyor scale.—Weighing Components, Inc., 64 Fulmore Rd., Hatboro, Pa.
Circle **557** on inquiry card.

Bagging Scale. New 6-page Bulletin 0156 describes and illustrates maker's "GA-38" automatic bagging scale.—Richardson Scale Co., Van Houten Ave., Clifton, N. J.
Circle **558** on inquiry card.

Scales. New 6-page folder describes maker's scales for batching, blending, sorting, packaging, etc.—The Exact Weight Scale Co., Columbus 8, Ohio.
Circle **559** on inquiry card.

Balances. Two 2-page data sheets presents maker's analytical balance accurate to 1/100,000 of capacity, and self-balancing 5,000 gm capacity scale.—Arthur S. LaPine & Co., 6001 S. Knox Ave., Chicago 29, Ill.
Circle **560** on inquiry card.



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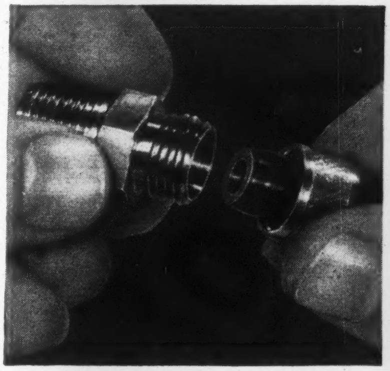

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This compact, rugged comparator is hermetically sealed in an inert gas and packaged for mounting in a standard octal socket. Two full-wave bridge rectifiers are used to obtain a high degree of stability and balance.

As phase sensitive comparators, these units can be used to measure the amplitude or phase of an input signal with respect to a reference signal. As demodulators, DC output can be obtained either single-ended or push-pull with respect to ground. Suitable for all military applications.

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Frequency Response: 0 to 5000 CPS; **Max. Reference Voltage:** 120V. RMS; **Max. Output Voltage:** ± 50V. DC; **Dynamic Range:** 46 db; **Load:** Max. 200K ohms, — Min. 20K ohms; **Input Impedance:** Approx. 200K ohms with 200K ohms load and 1:1 transformer. **Size:** 1″ dia. x 3″; **Weight:** 2 ozs.

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NEW LITERATURE

FLOW, PUMPS

Flowmeters. New 12-page Bulletin 130 describes and illustrates maker's armored "Rotameters". Price Lists 190, 130 and 110 cover special service, armored, and full-view rotameters.—Brooks Rotameter Co., Lansdale, Pa.

Circle **561** on inquiry card.

Filter Pump Units. New 4-page Bulletin 102 presents new centrifugal-type, all-plastic filter pumps for corrosive solutions, said to remove particles down to 1 micron.—Sethco Mfg. Co., 70 Willoughby St., Brooklyn 1, N. Y.

Circle **562** on inquiry card.

Vacuum Pumps. New 2-page issue of "Engineering News-Letter" (Vol. 1, No. 4) describe maker's vacuum pumps for handling corrosive vapors, also a bypass rotameter and finned-coil heat exchanger.—Schutte and Koerting Co., 2255 State Road, Cornwells Heights, Bucks County, Pa.

Circle **563** on inquiry card.

HUMIDITY

Humidity Instruments. New 22-page Bulletin H1009 presents maker's instruments for indicating, recording and automatic control of relative humidity and temperature.—The Bristol Co., Waterbury 20, Conn.

Circle **564** on inquiry card.

LEVEL

Liquid-Level Gage. New 8-page Bulletin 291 describes maker's "Truscale" gage that flashes red warning when boiler water level gets too high or too low.—Jerguson Gage & Valve Co., 80 Fellsway, Somerville 45, Mass.

Circle **565** on inquiry card.

Liquid Level Control. New 2-page Bulletin ALC-2.3 describes maker's "MEK-3001A" fail safe probe type liquid level control.—Machinery Electrification, Inc., Northboro, Mass.

Circle **566** on inquiry card.

SPEED, TIME

Tachometers. New 4-page Bulletin 105 describes and illustrates maker's stationary tachometers, speed indicators for general use, takeoff heads for medium speeds, and speed controls and recorders.—Metron Instrument Co., 432 Lincoln St., Denver 3, Colorado.

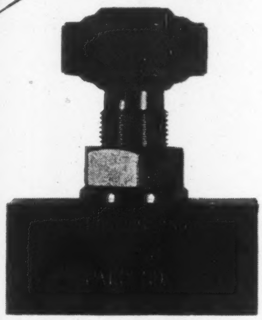
Circle **567** on inquiry card.

Speed Control. New 4-page Bulletin C-100 describes maker's variable speed control for electrical or pneumatic systems via variable speed drive.—Graham Transmissions, Inc., Menomonee Falls, Wis.

Circle **568** on inquiry card.

Cycle Timer. New 4-page Bulletin 323 pictures and describes maker's

ROBBINS Leakproof Metering Valves



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- "O" Rings and Teflon or Nylon Seats are standard.
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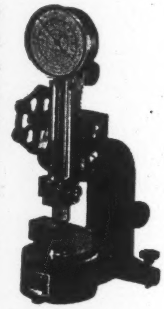

The Shore Instrument & Mfg. Co., Inc.
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Jamaica 35, N. Y.

For more information circle 200 on inquiry card.

multipulse repeat cycle timer.—Eagle Signal Corp., Moline, Ill.

Circle **569** on inquiry card.

AIR, SMOKE, STEAM

Compressor. New 4-page illustrated bulletin presents data on maker's line of oil-free air compressors.—Squire-Cogswell Co., Dept. 79, 4151 North Kedzie Ave., Chicago 18, Ill.

Circle **570** on inquiry card.

Smoke and Combustion Controller. New 2-page Data Sheet 10.14-2a describes maker's smoke density measuring system using Brown ElectroniK recorders.—Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne & Windrim Aves., Phila. 44, Pa.

Circle **571** on inquiry card.

Combustion Control. New 20-page booklet features article on "Control Fundamentals—Their Application to Combustion".—Cleveland Fuel Equipment Co., 1111 Brookpark Rd., Cleveland 9, Ohio.

Circle **572** on inquiry card.

Boiler Controls. New 8-page Bulletin C-63 describes and prices maker's boiler controls, including water level controls, relief valves, and safety devices. New 16-page Bulletin M-71 is service guide for boilers.—McDonnell & Miller, Inc., 3500 N. Spaulding Ave., Chicago 18, Ill.

Circle **573** on inquiry card.

MOTION, VIBRATION

Displacement Transducers. New 2-page bulletin illustrates and describes maker's displacement transducers.—Colvin Laboratories, Inc., East Orange, N. J.

Circle **574** on inquiry card.

Shock, Vibration Recorder. New 4-page Bulletin 7.5M describes and illustrates maker's impact, acceleration and gravity recorders.—The Impact-O-Graph Corp., 1900 Euclid Ave., Cleveland 15, Ohio.

Circle **575** on inquiry card.

SOUND, NOISE

Acoustical Research. New 20-page issue of Bruel & Kjaer "Technical Review" (July 1956, No. 3) features article on "Determination of Acoustical Quality of Rooms from Reverberation Curves."—Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.

Circle **576** on inquiry card.

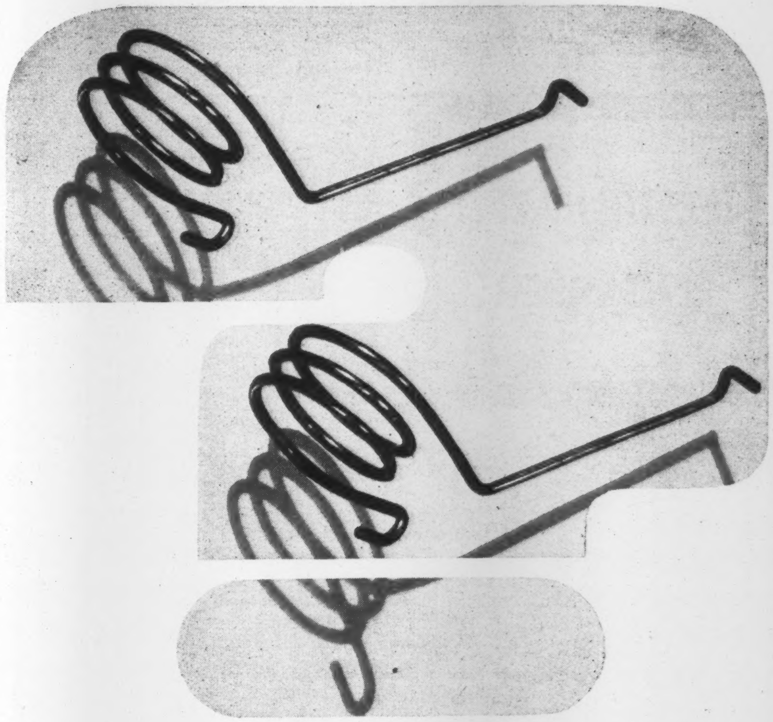
Noise Measurement. New 28-page issue of Bruel & Kjaer "Technical Review" (No. 4, 1955) describes measurements of sound, vibration and strain. Contains conversion table from decibels to sones.—Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.

Circle **577** on inquiry card.

Loudspeakers. New 24-page Bulletin 070 presents maker's professional loudspeakers including: drivers, rectangular horns, transformers, hi-fi, etc.—Jensen Manufacturing Co., 6601 S. Laramie Ave., Chicago 38, Ill.

Circle **578** on inquiry card.

Damping Meter. New 28-page leaflet describes maker's "Type DM 4 Dampometer," for recording the dampening of harmonic oscillations.



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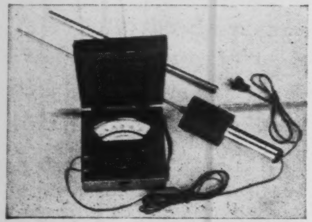

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RAWSON ELECTRICAL INSTRUMENT COMPANY
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MACHINES
FLOOR
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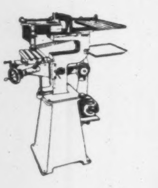
BENCH
MODELS



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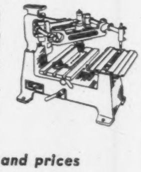

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For immediate attention write directly to manufacturer below. Ask for nearest representative.

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For more information circle **203** on inquiry card.

Includes two 2-page bulletins describing maker's universal 2-channel dc amplifier and Dampometer.—Oltronix, 235 Underwood Drive, Atlanta 5, Ga.

Circle **579** on inquiry card.

RECORDERS

Photo Panels. New 4-page brochure describes use of xerography in preparing and altering lists for photo panels, etc.—The Haloid Co., 20 Haloid St., Rochester 3, N. Y.

Circle **580** on inquiry card.

High-speed Cameras. New 12-page Bulletin F1-2 describes and illustrates maker's high-speed motion picture cameras and accessories.—Eastman Kodak Co., Rochester 4, N. Y.

Circle **581** on inquiry card.

TESTING, GAGING

Friction. New 24-page issue of Bruel & Kjaer "Technical Review" (April 1956, No. 2) features article on "Use of Resistance Strain Gages to Determine Friction Coefficients."—Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.

Circle **582** on inquiry card.

Spirit Levels. New 4-page Bulletin 7200 describes maker's spirit level vials.—W. & L. E. Gurley, Troy, N. Y.

Circle **583** on inquiry card.

Electronic Micrometers. New 4-page descriptive Bulletin 4003 illustrates maker's hand-operated electronic micrometers for direct, pressureless measurements.—J. W. Dice Co., Englewood, N. J.

Circle **584** on inquiry card.

Testing Instruments. New 8-page Catalog CS-56 presents illustrations and descriptions of maker's instruments for testing textiles, plastics, paper, insulation, extensometers, dial indicators, light metals, etc.—Custom Scientific Instruments, Inc., 541 Devon St., Kearny, N. J.

Circle **585** on inquiry card.

Abrasion Testing Set. New 6-page Bulletin 5604 pictures and describes maker's "Model 174" automatic abrasion testing set.—Taber Instrument Corp., 111 Goundry St., Section 59, North Tonawanda, N. Y.

Circle **586** on inquiry card.

Testing Machines. New 6-page Brochure 562 describes construction, operation and function of maker's vibration fatigue testing equipment.—All American Tool & Mfg. Co., 8027 Lawndale Ave., Skokie, Ill.

Circle **587** on inquiry card.

Air Gaging. New 12-page Catalog IPC-6-56 presents principles of air gaging with maker's "Precisionaire" column air-gaging instruments.—The Sheffield Corp., Div. 610, Dayton 1, Ohio.

Circle **588** on inquiry card.

Projection Gaging. New 12-page Bulletin F2-126 describes and illustrates maker's contour projectors and accessories.—Eastman Kodak Co., Rochester 4, N. Y.

Circle **589** on inquiry card.

COMPUTING, DATA HANDLING, COUNTING

Analog-to-Digital Converters. New 4-page Bulletin 372 describes and illustrates maker's analog-to-digital converters. Includes applications.—Norden-Ketay Corp., Instrument & Systems Div., Wiley St., Milford, Conn.

Circle **590** on inquiry card.

Data System. New 16-page Brochure 494 describes maker's "Model 111" data system used in monitoring, recording and processing functions.—Beckman Instruments, Inc., 2500 Fullerton Rd., Fullerton, Calif.

Circle **591** on inquiry card.

File Computer. New 4-page Bulletin PX71990 presents maker's "UNIVAC" file computer used for airlines reservation system.—Remington Rand Univac, Div. of Sperry Rand Corp., 1902 W. Minnehaha Ave., St. Paul W4, Minn.

Circle **592** on inquiry card.

Analog-to-Digital Encoder. New 4-page Bulletin 0756 presents maker's sub-miniature optical shaft position indicator.—The Baldwin Piano Co., 1801 Gilbert Ave., Cincinnati 2, Ohio.

Circle **593** on inquiry card.

Magnetic-Tape Handler. New 2-page bulletin describes and illustrates maker's "Model 101" digital magnetic-tape handler.—Key Electric Corp., 287 Post Ave., Westbury, N. Y.

Circle **594** on inquiry card.

Counters. New 6-page Catalog 400 presents maker's "Y" digital read-out counters.—Durant Manufacturing Co., 1929 N. Buffum St., Milwaukee 1, Wis.

Circle **595** on inquiry card.

OPTICAL

Electric Eyes. New 14-page Bulletin 562 describes and illustrates applications of maker's miniaturized electric eyes.—Ess Instrument Co., 96 S. Washington Ave., Bergenfield, N. J.

Circle **596** on inquiry card.

Lighting System. New 20-page booklet describes maker's "Sylvan-Aire" system of wall-to-wall lighting.—Sylvania Electric Products, Inc., 1740 Broadway, New York 19, N. Y.

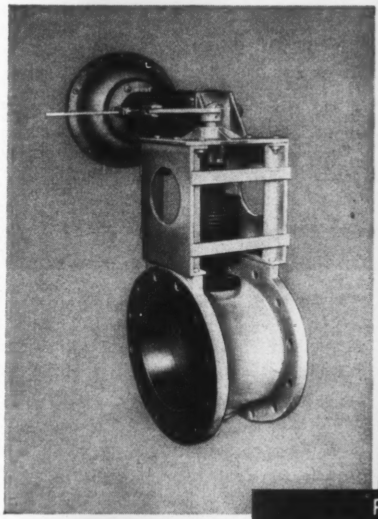
Circle **597** on inquiry card.

Microscopy Accessories. New 16-page booklet describes and illustrates maker's carbon specimen film and replica kit, rotating specimen support head, tungsten wire baskets, and other accessories for microscopy.—Ernest F. Fullam, Inc., P. O. Box 444, Schenectady 1, N. Y.

Circle **598** on inquiry card.

MONITORS

Chlorine Detector. New 4-page Bulletin 50.118 pictures and describes maker's "Series A-689" chlorine detector for warning of chlorine concentrations in air in excess of a pre-



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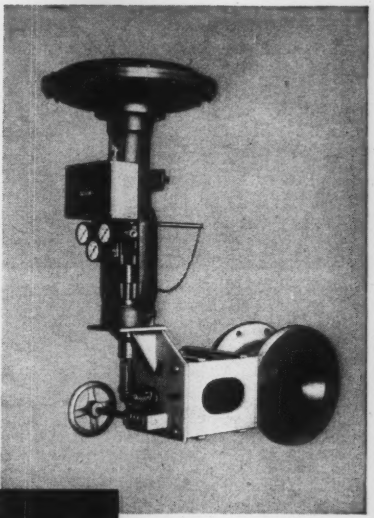

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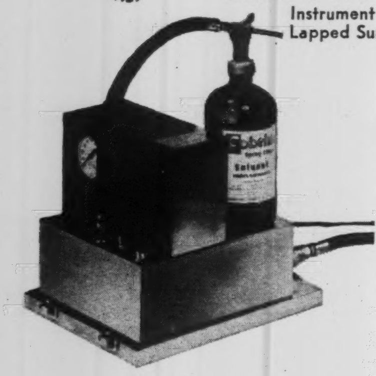

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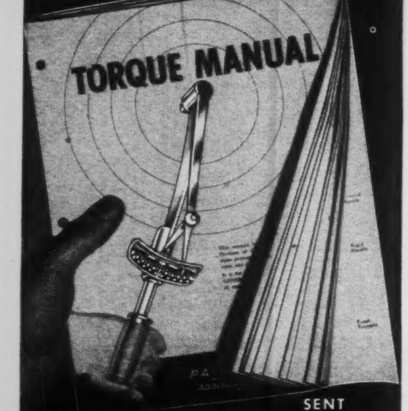

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NEW LITERATURE

selected value.—Wallace & Tiernan, Inc., 25 Main St., Belleville 9, N. J.
Circle **599** on inquiry card.

Gas Alarm. New 2-page descriptive Bulletin E-556-5M illustrates maker's J-W "Model E" combustible gas alarm. Includes prices.—Johnson-Williams, Ltd., Palo Alto, Calif.
Circle **600** on inquiry card.

Ultraviolet Lamp. New 2-page Bulletin B-100 pictures and describes maker's "Model B-100 Blak-Ray" long-wave ultra-violet source for chromatography, laboratory research and medical observation.—Ultra-Violet Products, Inc., 5114 Walnut Grove Ave., San Gabriel, Calif.
Circle **601** on inquiry card.

ANALYTICAL, LABORATORY

Analytical Instruments. New 4-page Bulletin 491 describes and illustrates maker's electrolytic hygrometer, infrared analyzer, leak detector, flow colorimeter, etc.—Beckman Instruments, Inc., Fullerton, Calif.
Circle **602** on inquiry card.

Infrared Spectroscopy. New 8-page Bulletin 18 features articles on infrared spectroscopy and data processing.—Beckman Instruments, Inc., 2500 Fullerton Rd., Fullerton, Calif.
Circle **603** on inquiry card.

Spectrophotometer. New 4-page illustrated Bulletin CH 370/3 describes British-made (Hilger & Watts, London) "Unispek" spectrophotometer.—The Jarrell-Ash Co., 26 Farwell St., Newtonville 60, Mass.
Circle **604** on inquiry card.

Carbon and Sulfur Determinator. New 16-page Bulletin 10-M-355 presents carbon and sulfur determination equipment for metals, petroleum catalysts, rubber, organic and inorganic materials, etc.—Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, Mich.
Circle **605** on inquiry card.

Gas Chromatography. New 2-page Bulletin H-TC7-56 presents maker's thermal conductivity cell for gas chromatography.—Gow-Mac Instrument Co., 100 Kings Rd., Madison, N. J.
Circle **606** on inquiry card.

Laboratory Ware. New 4-page illustrated Bulletin M 1017 presents data on maker's glass and teflon needle valves with Pyrex brand glassware.—The Emil Greiner Co., 20-26 N. Moore St., New York 13, N. Y.
Circle **607** on inquiry card.

Laboratory Items. New 4-page bulletin presents maker's polyethylene laboratory ware with prices.—Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago 22, Ill.
Circle **608** on inquiry card.

Laboratory Balances. New 32-page Catalog AW-13 describes and illustrates maker's analytical automatic balances, micro balances, assay balances, weight sets, etc.—William Ains-

worth & Sons, Inc., 2151 Lawrence St., Denver, Colorado.
Circle **609** on inquiry card.

Molecular Still. New 4-page bulletin describes and illustrates maker's 2 in. "Rota-Film" molecular still.—Arthur F. Smith Co., Rochester 3, N. Y.
Circle **610** on inquiry card.

AIRCRAFT

Fuel Pump. New 2-page Data Sheet 3-81 describes and illustrates maker's "Model RG-15800" electric motor driven aircraft fuel pump.—Lear, Inc., Lear-Romec Div., Elyria, Ohio.
Circle **611** on inquiry card.

Flight Attitude Indicator. New 12-page illustrated brochure describes maker's "Model 1035" flight attitude indicator.—Summers Gyroscope Co., 328 Broadway, Santa Monica, Calif.
Circle **612** on inquiry card.

RADIO, COMMUNICATIONS, ITV

Audio Amplifiers. New 32-page brochure "Application Notes" on transistor audio amplifiers.—General Electric Co., Semiconductor Products, Dept., Syracuse, N. Y.
Circle **613** on inquiry card.

Wireless Intercom. New 4-page bulletin describes and prices maker's "Port-A-Phone" portable wireless intercom.—General Industrial Co., 5736B Elston Ave., Chicago 30, Ill.
Circle **614** on inquiry card.

VHF Receiver. Two new 2-page specification sheets describe maker's "Model R 5200" VHF receiver used for monitoring, meteor research, flight-testing, etc., and maker's "Model 503" 5000 volt dc power supply.—Servo Corp. of America, New Hyde Park, N. Y.
Circle **615** on inquiry card.

ITV Camera. New 2-page Specification Sheet PD-152 describes maker's ruggedized television camera designed for operation in high vibration and noise environments.—General Precision Lab., 63 Bedford Rd., Pleasantville, N. Y.
Circle **616** on inquiry card.

ELECTRICAL, ELECTRONIC INSTRUMENTS

Signal Generator. New 8-page Catalog Sheet ED 11503 presents maker's signal generator and control system for audio frequency range.—Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.
Circle **617** on inquiry card.

Panel Instruments. New 28-page Bulletin A-7-E presents specifications on maker's ac and dc instruments, power level meters, VU and DB meters, frequency meters and wattmeters.—Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.
Circle **618** on inquiry card.

Utility Tester. New 4-page bulletin presents maker's new utility tester for measuring voltages, currents, re-

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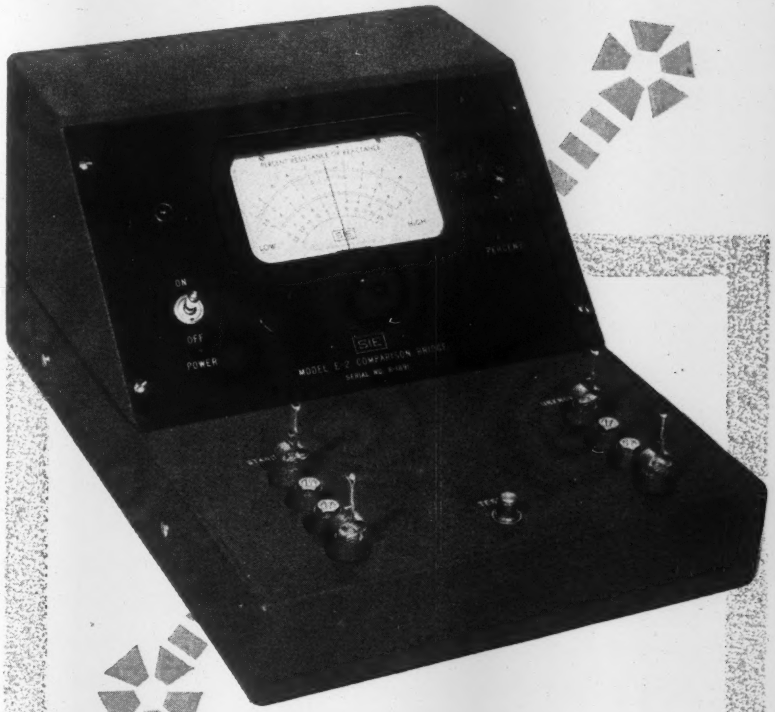

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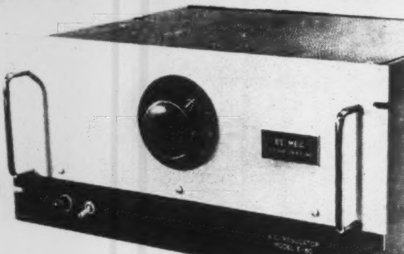

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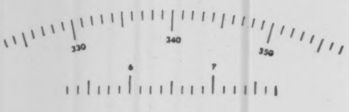

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NEW LITERATURE

sistances, leakages.—Moss Electronic Dist. Co., Inc., 3849 Tenth Ave., New York 34, N. Y.
Circle **619** on inquiry card.

Electrolysis Voltmeter. New 2-page bulletin presents maker's dual electrolysis voltmeter.—Stewart Bros., 315 W. Walton Pl., Chicago 10, Ill.
Circle **620** on inquiry card.

Shorted-Turns Indicator. New 2-page Bulletin M-1 describes maker's new shorted-turns indicator for go-no-go testing of shorts and open circuits.—B & K Mfg. Co., 3731 N. Southport Ave., Chicago 13, Ill.
Circle **621** on inquiry card.

ELECTRONIC COMPONENTS

Isolators. New 4-page illustrated Brochure W-103 describes maker's Ferrite isolators for microwave circuits, reducing frequency pulling of the magnetron, reducing moding, etc. —Kearfott Co., Inc., Western Div., 253 M. Vinedo Ave., Pasadena, Calif.
Circle **622** on inquiry card.

Printed Circuitry. New 16-page illustrated Brochure 688 presents data on maker's copper clad laminated plastics for printed circuitry.—Formica Corp., 4614 Spring Grove Ave., Cincinnati 32, Ohio.
Circle **623** on inquiry card.

Plug-In Components. New 4-page bulletin is quick-index guide to maker's basic components for plug-in unit construction. New 4-page folder includes "Get Started" kit and news on techniques in plug-in circuitry.—Alden Products Co., 127 N. Main St., Brockton, Mass.
Circle **624** on inquiry card.

Magnetic Cores. New 4-page Bulletin MT-103 presents maker's "S-1" ferramic magnetic cores.—General Ceramics Corp., Keasbey, N. J.
Circle **625** on inquiry card.

Plug-In Units. New 2-page Catalog 11386 presents maker's new plug-in units embedded in mica-filled epoxy with color-coded banding.—The Walkirt Co., 145 W. Hazel St., Inglewood, Calif.
Circle **626** on inquiry card.

Radio and TV Knobs. New 16-page Catalog 57 illustrates maker's line of radio-television knobs, speaker kits, etc.—Gee-Lar Mfg. Co., 400 South Wyman St., Rockford, Ill.
Circle **627** on inquiry card.

Microwave Components. New 12-page Catalog C-756 presents data on maker's X-band balanced mixers, cable connectors, single and dual crystal holders, etc.—Microwave Development Labs., Inc., 92 Broad St., Babson Park, Wellesley 57, Mass.
Circle **628** on inquiry card.

Microwave Components. New 20-page Catalog 5-6A illustrates and describes maker's microwave test equipment and waveguide components.—Lieco, Inc., 3610 Oceanside Rd., Oceanside, L. I., N. Y.
Circle **629** on inquiry card.

Nylon Bobbins and Washers. New 4-page Bulletin BW 756 presents specifications on maker's nylon bobbins and molded nylon washers.—Cosmo Plastics Co., 3239 W. 14th St., Cleveland 9, Ohio.

Circle **630** on inquiry card.

Electronic Components. New 20-page Catalog C56-B presents list of maker's miniature toggle and rotary switches, condensers, transformers, motors, dynamotors, etc.—Wells Sales, Inc., 833 W. Chicago Ave., Chicago 22, Ill.

Circle **631** on inquiry card.

Sweep Generators. New 2-page Bulletin 5M7-56 describes and illustrates maker's broad-band sweep generators and pulse markers.—Telonic Industries, 73 N. Second Ave., Beech Grove, Ind.

Circle **632** on inquiry card.

Coaxial Slotted Lines. Two new 2-page data sheets presents maker's line of standard reflections for calibrating slotted line impedance meters and standardizing reflectometers and describes (Model 230 Type N and Model 230B 7/8") coaxial slotted lines of parallel plane type.—The Narda Corp., 160 Herricks Rd., Mineola, L. I., N. Y.

Circle **633** on inquiry card.

Radio, TV Electronic Accessories. New 80-page Catalog 157 presents cements, connectors, printed circuit repair kits, and thousands more radio-TV service aids.—General Cement Mfg. Co., Rockford, Ill.

Circle **634** on inquiry card.

Electronics Catalog. New 356-page 1957 General Catalog includes 27,000 items of industrial maintenance, research and production electronic parts and equipment.—Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.

Circle **635** on inquiry card.

Capacitors. New 4-page Catalog 55-1B presents "Vitramon" capacitors, said to have unusually stable electrical characteristics over a wide range of temperatures and frequencies.—Vitramon, Inc., Box 544, Bridgeport 1, Conn.

Circle **636** on inquiry card.

Power Amplifier. New 4-page Bulletin 2100 presents maker's magnetic switching amplifier "SA-2".—Magnetic Controls Co., Minneapolis, Minn.

Circle **637** on inquiry card.

Electronic Component Data Service. New 8-page bulletin presents company's electronic component data service.—Derivation and Tabulation Associates, Inc., 67 Lawrence Ave., West Orange, N. J.

Circle **638** on inquiry card.

POWER SUPPLIES

Power Supply. New 2-page bulletin presents maker's "Series Z-95000" dc-dc power supply.—EECO Production Co., 506 E. First St., Santa Ana, Calif.

Circle **639** on inquiry card.

Power Rectifiers. New 4-page Bulletin TE-1337 describes maker's high-

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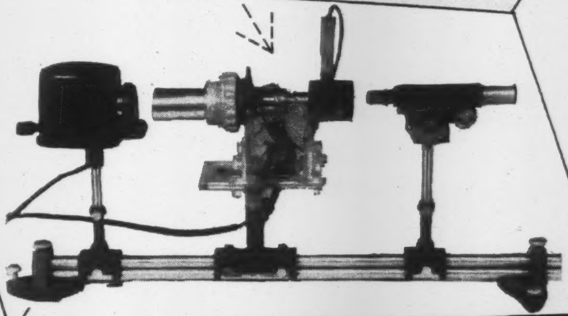

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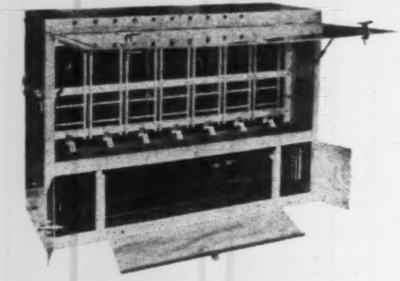

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NEW LITERATURE

current silicon power rectifiers. Two new 2-page sheets describe high-frequency silicon bonded diodes and high-conductance silicon junction diodes.—Transitron Electronic Corp., Melrose 76, Mass.

Circle **640** on inquiry card.

Transistorized Power Supplies. New 8-page brochure presents maker's complete line of transistorized and tubeless equipment such as power supplies, test equipment, etc.— Electronic Research Associates, Inc., 67 East Centre St., Nutley 10, N. J.

Circle **641** on inquiry card.

Power Supplies. New 8-page Bulletin CV-235 presents maker's constant voltage dc power supplies.—Sola Electric Co., 4633 West 16th St., Chicago 50, Ill.

Circle **642** on inquiry card.

DC Power Supply. New 2-page leaflet TDS-503 describes maker's 5000-volt dc power supply Model 503.—Servo Corp. of America, 20-20 Jericho Turnpike, New Hyde Park, L. I., N. Y.

Circle **643** on inquiry card.

Power Supply. New 2-page bulletin describes maker's regulated power supply with positive, continuously variable output of 0 to 500 vdc at 200 ma. —Oltronix, 235 Underwood Drive, Atlanta 5, Ga.

Circle **644** on inquiry card.

RESISTORS, POTENTIOMETERS

Resistors. New 2-page Data Sheet EB2 (2) presents maker's adjustable dc resistors.—Leeds & Northrup Co., 4934 Stenton Ave., Phila. 44, Pa.

Circle **645** on inquiry card.

Potentiometer. New 2-page Data Sheet 54-44 illustrates and describes maker's 1-7/16" diameter "Series 5400" precision potentiometer for servo or bushing mounting.—Helipot Technical Information Service, Newport Beach, Calif.

Circle **646** on inquiry card.

Potentiometers. New 2-page Bulletin 207/6/H presents specifications on maker's "Model 207 Hi-R Trimpot" and "Model 208 Hi-R TrimR".—Bourns Laboratories, 6135 Magnolia Ave., Riverside, Calif.

Circle **647** on inquiry card.

Precision Potentiometer. New 2-page Data Sheet 54-66 illustrates and presents specifications on maker's 3" diameter "Series 5700" precision potentiometer.—Helipot Technical Information Service, Newport Beach, Calif.

Circle **648** on inquiry card.

Potentiometers. Three new 2-page bulletins present maker's "Type 1410", "Type TM-10", and "Type TS-10" helical potentiometers.—Van Dyke Textigraph Co., Inc., 23 W. 2nd St., Chattanooga, Tenn.

Circle **649** on inquiry card.

Fuse Resistor. New 2-page Bulletin P-3 presents data on applications, design, ranges, tolerance, etc. on maker's "Type FR" fuse resistor.—

International Resistance Co., 401 N. Broad St., Phil. 8, Pa.
Circle **650** on inquiry card.

Resistors. New 4-page Bulletin B-9a presents maker's line of molded deposited carbon resistors. New 4-page Bulletin B-8b presents molded boron-carbon resistors. New 4-page Bulletin B-4b presents maker's 1/2, 1, and 2 watt deposited carbon precision resistors.—International Resistance Co., 401 N. Broad St., Phila. 8, Pa.
Circle **651** on inquiry card.

SWITCHES, RELAYS

Switches. New 4-page issue "Uses Unlimited" (Vol. 10, No. 2) describes pushbutton, toggle, and snap-acting switches.—Micro Switch Div., Minneapolis-Honeywell Regulator Co., Freeport, Ill.
Circle **652** on inquiry card.

Switches, Relays. New 2-page "Cook Diaphlex Newsletter" (Vol. 1, No. 30) presents specifications on maker's hermetically sealed voltage-standard, acceleration switch, and relay.—Cook Electric Co., 2700 No. Southport Ave., Chicago 14, Ill.
Circle **653** on inquiry card.

Toggle Switches. New 2-page bulletin presents data on maker's subminiature toggle switches.—Miniature Switch Corp., 3610 Oceanside Rd., Oceanside, L. I., N. Y.
Circle **654** on inquiry card.

WIRE, CONNECTORS

Electrical Wire Terminals. New 36-page "Adventures of Grandpa Champ," a hardbound well-illustrated booklet, humorously treats dangers of improper handling of electrical wiring, presents applications of maker's terminals, and lists rules for general electrical safety.—Aircraft-Marine Products, Inc., 2100 Paxton St., Harrisburg, Penna.
Circle **655** on inquiry card.

Printed Circuit Receptacles. New 2-page Bulletin 44 presents maker's printed circuit receptacles and connectors.—Microdot, Inc., 1826 Fremont Ave., South Pasadena, Calif.
Circle **656** on inquiry card.

Wire. New 100-page catalog (replaces Oct. 1954 edition) presents maker's alloy, clad, and plated wire & ribbon, also weld and "Carbostrip" products. New 12-page booklet describes manufacturing facilities and tabulates compositions of various wires and ribbon.—Sylvania Electric Products, Inc., 12 Second Ave., Warren, Penna.
Circle **657** on inquiry card.

TRANSISTORS

Transistors. Two new 4-page Bulletins ECG-144 and ECG-153 present specifications on maker's new PNP junction transistors. Includes 2-page Specification Sheet ECG-109.—General Electric Co., Electronics Park, Syracuse, N. Y.
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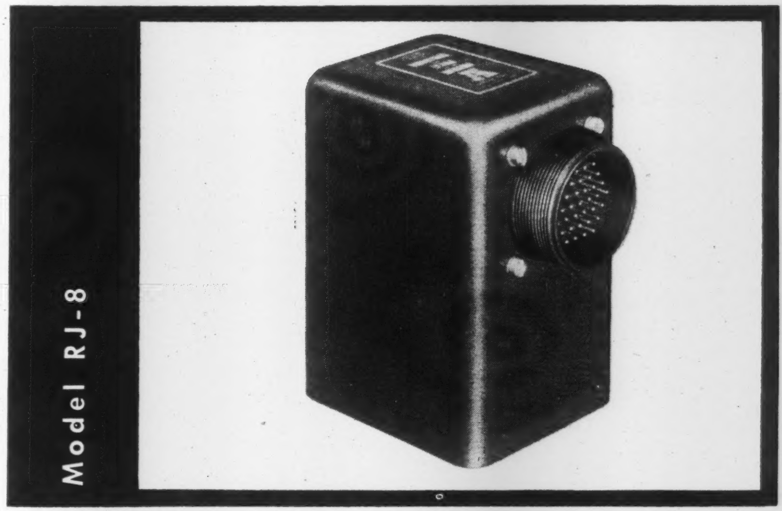

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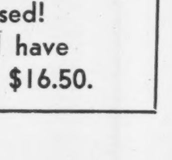

Tensitron, Inc., Harvard, Mass.

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NEW LITERATURE

MECHANICAL AND ELECTROMECHANICAL COMPONENTS

Set Screws. New 6-page Bulletin DM 723 presents theory and applications of multiple-spline socket screws.—The Bristol Co., Waterbury 20, Conn.

Circle **659** on inquiry card.

Variable Speed Drive. New 8-page Bulletin 521 pictures and describes maker's variable speed drive.—Graham Transmissions, Inc., Menomonee Falls, Wis.

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Bearings. New 32-page Bulletin AFB-1 describes and illustrates maker's special-application anti-friction bearings.—Industrial Tectonics, Inc., 3686 Jackson Rd., Ann Arbor, Mich.

Circle **661** on inquiry card.

Motor Pulleys. New 8-page Bulletin V-563 describes maker's "Series 80" "Reeves Jr." variable speed motor pulleys.—Reeves Pulley Co., 1225 Seventh St., Columbus, Ind.

Circle **662** on inquiry card.

Bellows. New 20-page Catalog 155 is design guide for application and selection of metallic bellows.—Flexonics Corp., 1337 S. Third Ave., Maywood, Ill.

Circle **663** on inquiry card.

Grooved Fasteners. New 24-page catalog describes maker's line of "Driv-Lok" grooved fasteners; used also as linkage pins, anchors, etc.—Driv-Lok Pin Co., Sycamore, Ill.

Circle **664** on inquiry card.

Slip Ring Assemblies. New 4-page bulletin describes and illustrates maker's slip ring assemblies and commutators for gyroscopes, motors, resolvers, etc.—Slip Ring Company of America, 12820 Venice Blvd., Los Angeles 66, Calif.

Circle **665** on inquiry card.

Torque Gages. New 4-page bulletin describes maker's six models of "Torque-Watch" dial-reading gages for measuring extremely low-torque on potentiometers, servo mechanism, gear trains, etc.—Waters Mfg., Inc., P. O. 368, So. Sudbury, Mass.

Circle **666** on inquiry card.

TUBING, FITTINGS

Tube Fittings. New 12-page Catalog 4324 lists maker's "Intru-lok" flareless tube fittings providing tube entry and connection without fitting disassembly.—Tube and Hose Fittings Div., Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio.

Circle **667** on inquiry card.

Cabled Tubes. New 12-page Bulletin 356 describes and tabulates maker's cabled tubes used for instruments and controls.—Crescent Insulated Wire & Cable Co., Trenton 5, N. J.

Circle **668** on inquiry card.

Super-Pressure Tubing. New 6-page Data Memorandum #22 presents maker's single and composite-wall tubing for pressures up to 100,000 psig. Includes table for minimum bursting pressures for single heavy wall tubing. —Superior Tube Co., 1564 Germantown Ave., Norristown, Pa.

Circle **669** on inquiry card.

Fittings and Flanges. New 4-page Data Card TDC-186 tabulates ASTM specifications of tubular products fittings and flanges in various grades of steel.—Babcock & Wilcox Co., Tubular Products Div., Beaver Falls, Pa.

Circle **670** on inquiry card.

Fittings, Flanges. New 6-page Bulletin FB-502 describes maker's line of carbon, alloy and stainless steel seamless welding fittings and forged steel flanges.—Babcock & Wilcox Co., Tubular Products Div., Beaver Falls, Pa.

Circle **671** on inquiry card.

Plastic Tube and Rod Stock. New 2[illegible]-page catalog presents data and prices on maker's plastic rod and tube stock—Friedrich & Dimmock, Inc., Lincoln Ave., Millville, N. J.

Circle **672** on inquiry card.

Laminated Tubing. New 2-page Data Sheet 221 pictures maker's "Poro-Tube" laminated tubing.—Lamtex Industries, Inc., 51 State St., Westbury, L. I., N. Y.

Circle **673** on inquiry card.

MATERIALS

Phenolic Compounds. New 4-page Bulletin CDC-326 presents maker's black and brown general-purpose phenolic compounds.—Chemical Materials Dept., General Electric, Pittsfield, Mass.

Circle **674** on inquiry card.

Insulating Tape. New 4-page illustrated Brochure CCD-1 describes maker's "Irrathene" irradiated polyethylene insulating tape for motor repair shops.—General Electric Co., One Plastics Ave., Pittsfield, Mass.

Circle **675** on inquiry card.

Plastics. New 6-page folder lists plastics for electronics, including casting resins, foams, microwave absorbers, rod and sheet.—Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.

Circle **676** on inquiry card.

Bondable Teflon, Rulon. Three new bulletins present data on bondability of Teflon and Rulon in tape, film, rod, sheet or welded form.—Dixon Corp., Bristol, R. I.

Circle **677** on inquiry card.

Non-Woven Felts. New 14-page Bulletin D-78 presents data on properties of maker's non-woven felts of 100% dacron.—E. I. DuPont de Nemours & Co., Inc., Textile Fibres Dept., Wilmington, Dela.

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Electrical Insulation. New 16-page booklet presents information on

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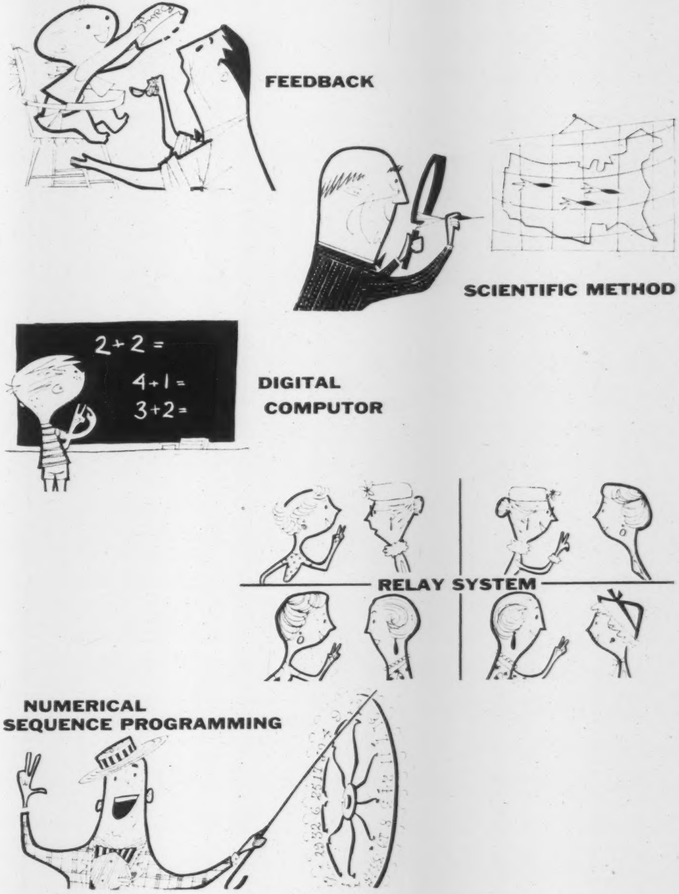

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Advertisers' Index

Accuracy Scientific Instrument Co. 2114
AEMCO Incorporated 2104
Aero Research Instrument Company, Inc. 2112
A'G'A Division of Elastic Stop Nut Corp. of America 2115
Aircraft-Marine Products, Inc. 1912
Allen-Bradley Co. 1960
Allied Radio Corporation 2115
American Chain & Cable Company 2057
American Machine and Metals, Inc. 1903
American Meter Company 1900-1901
American Sugar Refining Company 2122
Amphenol Electronics Corporation 2054
Amthor Testing Instrument Co., Inc. 2092
Applied Science Corp. of Princeton 2095
Arnoux Corporation 2129
Askania Regulator Company 2047
Assembly Products, Inc. 2034
Associated Spring Corporation 2085
Auburn Manufacturing Company 1898
Automatic Switch Co. 1975
Autonetics Division, North American Aviation, Inc. 2033

Bailey Meter Company 2011
Baker Company, Inc. 2115
Baker & Company, Inc. 1945, 2048
Baldwin-Lima-Hamilton Corporation 1940
Barber-Colman Company 2060
Barber-Colman Company, Wheelco Instruments Div. 2061
Barksdale Valves 1934
Battelle Institute 2111
Beckman Instruments, Inc. 1924
Bell Aircraft Corp. 2118
Berkeley Division, Beckman Instruments, Inc. 2022
Bishop & Co. Platinum Works, J. 2024
Borg Corporation, George W. 2059
Branson Ultrasonic Co. 2098
Bristol Company 1920, 1946, 2037
Brooks Rotameter Company 2045
Brown Instruments Division of Minneapolis-Honeywell Regulator Co. 2012-2013, 2071
Bruno—New York Industries Corporation 2038
Brush Electronics Company 1963
Bryant Chucking Grinder Co. 2052
Burnell & Co., Inc. 1953

Cambridge Instrument Co., Inc. 2111
Canadian Industries Limited 2099
Chace Co., W. M. 2103
Christiansen Corporation 2117
Clare & Co., C. P. 1943
Cobehn, Inc. 2124
Cohn Mfg. Co., Inc., Sigmund 2094
Comar Electric Company 2044
Commercial Research Division 1956
Computer Instruments Corporation 2056
C.O.M.S.I.P. 2130
Conoflow Corporation 2097
Consolidated Electrodynamics Corporation 2028, 2041
Courtney & Co. 2117
Cramer Controls Corporation 2113
Crawford Fitting Co. 2053
Crescent Insulated Wire and Cable Co. 2077
Crucible Steel Company of America 1931
Curtiss-Wright Corporation 1902, 2093

Dahl Company, George W. 1926
Davis Instruments 1898
Diamond Power Specialty Corp. 2105
Dietert Co., Harry W. 2109
Dimco-Gray Company 2108
Doelcam, Division of Minneapolis-Honeywell Regulator Co. 1959
Du Mont Laboratories, Inc., Allen B. 2039
du Pont de Nemours & Co., Inc., E. I. 2082

Eagle Signal Corporation 2064
Eastern Air Devices, Inc. 2091
Edison Incorporated, Thomas A. 1957
Electrical Testing Laboratories, Inc. 2084
ElectroData Division of Burroughs 1942
Electronic Associates, Inc. 2014
Electronic Control Systems, Inc. 2058
Electro-Pulse, Inc. 2100

Elgin National Watch Company 1955
El Mec Laboratories, Inc. 2126
Engineered Electronics Co. 2116
Eppley Laboratory, Inc. 1922
Epsco, Inc. 1958

Fairchild Controls Corporation, Components Division 2094
Falstrom Company 1894
Fenwal Incorporated 1950
Fielden Instrument Division 1977
Fischer & Porter Co. ....Inside Back Cover
Foxboro Company 1908-1909, 1973
Freed Transformer Co., Inc. 2126
Fulton Sylphon Division 1918-1919

Gaertner Scientific Corporation 2102
Gatti, Inc., Aurele M. 2036
General Electric Company 2108
General Electric Company, X-Ray Department 1923
General Precision Laboratory Incorporated 2050
Genisco Incorporated 1976
Gilman, Inc., Russell T. 2070
Goodyear Aircraft Corporation 1893
Goodyear Atomic Corporation 2128
Gordon Co., Claud S. 2102
Gow-Mac Instrument Co. 2040
Graton & Knight Company 2092

Hagan Corporation 1910-1911
Hagen Manufacturing Company, Inc. 2067
Hammel-Dahl Company ....Back Cover
Heise Bourdon Tube Company, Inc. 2063
Helicoid Gage Division 2057
Heller Co., Gerald K. 2045
Hetherington, Inc. 2109
Hewlett-Packard Company 1933
Hexacon Electric Company 2100
Hycon Electronics, Inc. 2049

Illinois Testing Laboratories, Inc. 2030, 2042
Imperial Brass Mfg. Co. 2032
Indicating Calipers Corp. 2130
Industrial Engineering Corporation 2036
Industrial Test Equipment Co. 2114
International Business Machines Corporation 1978
International Rectifier Corporation 2065

Johnson Company, E. F. 2062
Jones Optical Works, A. D. 2032

Kay Lab. 2086
Kearfott Company, Inc. 2051
Kieley & Mueller, Inc. 1928
Klipfel Valves Inc. 1939
Kybernetes Corporation 1921

Leeds & Northrup Company 1964
Leslie Co. 1962
Levin & Son, Inc., Louis 1936
Lewis Engineering Company 1904
Lewis Spring & Manufacturing Company 2121
Logan Engineering Co. 2034
Lynn, Robert M. 2090

Makepeace Company, D. E. 2110
Mallory & Co., Inc., P. R. 2069
Manning, Maxwell & Moore, Inc. 1972, 2075
Marsh Instrument Co. 2110
Marshalltown Manufacturing Co. 2040
Measurements Corporation 2090
Mercoid Corporation 2112
Mid-Century Instrumatic Corp. 2020
Midwestern Instruments ....Inside Front Cover
Milford Rivet & Machine Co. 2117
Minneapolis-Honeywell Regulator Co., Industrial Division 2012-2013, 2071, 2078
Moeller Instrument Company 1938

Nash Engineering Company 1974
Nester Company, Inc., L. G. 1942
Ney Company, J. M. 2092

Ohaus Scale Corporation 2065
Optical Coating Laboratory, Inc. 2010
Orchem Pumps, Inc. 2112

Palmer Thermometers, Inc. 2086
Panellit, Inc. 2026
Parker Appliance Company 2119
Pennsylvania Fluorocarbon Co., Inc. 2088
Phoenix Precision Instrument Co. 1929
Post Machinery Co. 1941
Potter Aeronautical Company 1915
Precision Products Company Inc. of Waltham 2030
Preis Engraving Machine Co., H. P. 2122
P-W Industries, Inc. 2084

Q-O-S Corporation 2127

Racine & Company, Inc., Jules 2113
Radio Frequency Laboratories, Inc. 2088
Ramo-Wooldridge Corporation 2005
Rawson Electrical Instrument Company 2122
Reeves Instrument Corporation 1948
Remington Rand Univac 2025
Renick Co., L C. 2126
Republic Aviation 1932
Richards Co., Inc., Arklay S. 2130
Richardson Camera Company 2101
RKL Valve & Manufacturing Co. 2104
Robbins Aviation 2120
Rochester Manufacturing Co., Inc. 1954
Rockwell Manufacturing Company 1937

Sanborn Company 1897
Sanders Associates Incorporated 2120
Scam Instrument Corp. 2080
Scherr Co., Inc., Geo. 2042
Sensitive Research Instrument Corporation 1894
Servomechanisms, Inc. 2079
Shallcross Manufacturing Company 2089
Shore Instrument & Mfg. Co., Inc. 2120
Skinner Electric Valve Division 1944
Smith Co., S. Morgan 2123
Smith-Corona Inc. 2035
Sorensen & Co., Inc. 1917
Southwestern Industrial Electronics Company 2125
Spencer-Kennedy Laboratories, Inc. 2096
Sprengnether Instrument Co., Inc., W. F. 2113
Standard Electric Time Company 1906-1907
Staplex Co. 2110
Statham Development Corporation 2097
Statham Laboratories 2055
Stevens-Arnold Incorporated 2111
Stromberg-Carlson 2068
Sturtevant Co., P. A. 2124
Superior Electric Company 1961
Superior Tube Company 2031
Surprenant Mfg. Co. 2081

Taylor Pivot Company 2130
Technique Associates, Inc. 2028
Teletronics Laboratory, Inc. 2087
Tensitron, Inc. 2130
Texas Instruments Incorporated 1935
Thermo-Couple Products Company 2093
Trimount Instrument Co. 2076
Truline Process Co. 2114

Uehling Instrument Co. 2124
Unertl Optical Co., John 2128
Union Switch & Signal Division 1899
United States Gauge, Div. of American Machine and Metals, Inc. 1903
United States Radium Corpporation 2096
Universal General Corp. 2107

Veeder-Root Incorporated 2073
Victoreen Instrument Co. 1914

Wallace & Tiernan Incorporated 2066
Waterman Products Co., Inc. 1927
Waukee Engineering Company 2108
Weksler Thermometer Corporation 1925
West Instrument Corporation 2099
Weston Electrical Instrument Corporation 2029
Wheelco Instruments Div., Barber-Colman Company 2061
White Instrument Laboratories 2072
Wiancko Engineering Co. 2094
Wolfe & Mann Mfg. Co. 2118

Zenith Electric Co. 1930

NEW LITERATURE

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Cellulose Wadding. New 8-page bulletin describes maker's "Cel-Fibe" cellulose wadding.—Cel-Fibe Div., Personal Products Corp., Milltown, N. J.
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Stress Analysis Material. New technical data sheets describe maker's "Hysol 6000-OP" used fo rthree-dimensional photoelastic studies. Includes 4-page Price List 6000 OP.—Houghton Labs., Inc., Olean, N. Y.
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Coated Fabrics. New bulletin 2-page Data Sheet presents specifications on maker's "Kel-F" elastomer coated fabrics.—Connecticut Hard Rubber Co., New Haven 9, Conn.
Circle **682** on inquiry card.

FABRICATION

Production Facilities. New 32-page illustrated bulletin describes operations of Mallory's Capacitor, Resistor, Switch, Vibrator, Welding Depts., etc.—P. R. Mallory & Co., Inc., Indianapolis 6, Ind.
Circle **683** on inquiry card.

Gas Producers. New 4-page Brochure GEC-1391 presents data on maker's "Thermalene" endothermic gas producers for production of protective atmosphere gases for heat treating.—General Electric Co., Schenectady 5, N. Y.
Circle **684** on inquiry card.

Molds for Plastics. New 4-page instruction leaflet explaining composition and uses of mold preparation materials for phenolic resins and epoxy resins.—Marblette Corp., 37-31 Thirtieth St., Long Island City 1, N. Y.
Circle **685** on inquiry card.

Rotary Cutting Tools. New 8-page bulletin "Golden Circle Rotary Tools" presents maker's line of ground cutters, rotary files, miniature cutters, etc.—Elgin National Watch Co., Elgin, Ill.
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Welding Equipment. New 16-page Catalog 2-100 describes and illustrates maker's welding heads, power supplies, all-electronic control units, etc. —Raytheon Manufacturing Co., Dept. 6120, Waltham 54, Mass.
Circle **687** on inquiry card.

Protective Coatings. New 4-page illustrated Bulletin 656 describes maker's line of "Thermo-Cote N-4" strippable protective coatings.—Bischoff Chemical Corp., Ivoryton, Conn.
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Coating Materials. New 6-page folder illustrates maker's "Turcoat" line of phosphating and metal protective coating materials.—Turco Products, Inc., 6135 So. Central Ave., Los Angeles 1, Calif.
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5	30	55	80	105	130	155	180	205
6	31	56	81	106	131	156	181	206
7	32	57	82	107	132	157	182	207
8	33	58	83	108	133	158	183	208
9	34	59	84	109	134	159	184	209
10	35	60	85	110	135	160	185	210
11	36	61	86	111	136	161	186	211
12	37	62	87	112	137	162	187	212
13	38	63	88	113	138	163	188	213
14	39	64	89	114	139	164	189	214
15	40	65	90	115	140	165	190	215
16	41	66	91	116	141	166	191	216
17	42	67	92	117	142	167	192	217
18	43	68	93	118	143	168	193	218
19	44	69	94	119	144	169	194	219
20	45	70	95	120	145	170	195	220
21	46	71	96	121	146	171	196	
22	47	72	97	122	147	172	197	
23	48	73	98	123	148	173	198	
24	49	74	99	124	149	174	199	
25	50	75	100	125	150	175	200	

New Instruments							
301	326	351	376	401	426	451	476
302	327	352	377	402	427	452	477
303	328	353	378	403	428	453	478
304	329	354	379	404	429	454	479
305	330	355	380	405	430	455	480
306	331	356	381	406	431	456	
307	332	357	382	407	432	457	
308	333	358	383	408	433	458	
309	334	359	384	409	434	459	
310	335	360	385	410	435	460	
311	336	361	386	411	436	461	
312	337	362	387	412	437	462	
313	338	363	388	413	438	463	
314	339	364	389	414	439	464	
315	340	365	390	415	440	465	
316	341	366	391	416	441	466	
317	342	367	392	417	442	467	
318	343	368	393	418	443	468	
319	344	369	394	419	444	469	
320	345	370	395	420	445	470	
321	346	371	396	421	446	471	
322	347	372	397	422	447	472	
323	348	373	398	423	448	473	
324	349	374	399	424	449	474	
325	350	375	400	425	450	475	

New Literature								
501	526	551	576	601	626	651	676	701
502	527	552	577	602	627	652	677	702
503	528	553	578	603	628	653	678	703
504	529	554	579	604	629	654	679	704
505	530	555	580	605	630	655	680	705
506	531	556	581	606	631	656	681	706
507	532	557	582	607	632	657	682	
508	533	558	583	608	633	658	683	
509	534	559	584	609	634	659	684	
510	535	560	585	610	635	660	685	
511	536	561	586	611	636	661	686	
512	537	562	587	612	637	662	687	
513	538	563	588	613	638	663	688	
514	539	564	589	614	639	664	689	
515	540	565	590	615	640	665	690	
516	541	566	591	616	641	666	691	
517	542	567	592	617	642	667	692	
518	543	568	593	618	643	668	693	
519	544	569	594	619	644	669	694	
520	545	570	595	620	645	670	695	
521	546	571	596	621	646	671	696	
522	547	572	597	622	647	672	697	
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Company Address .... City .... Zone .... State ....

Products Manufactured ....

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Advertised Products								
1	26	51	76	101	126	151	176	201
2	27	52	77	102	127	152	177	202
3	28	53	78	103	128	153	178	203
4	29	54	79	104	129	154	179	204
5	30	55	80	105	130	155	180	205
6	31	56	81	106	131	156	181	206
7	32	57	82	107	132	157	182	207
8	33	58	83	108	133	158	183	208
9	34	59	84	109	134	159	184	209
10	35	60	85	110	135	160	185	210
11	36	61	86	111	136	161	186	211
12	37	62	87	112	137	162	187	212
13	38	63	88	113	138	163	188	213
14	39	64	89	114	139	164	189	214
15	40	65	90	115	140	165	190	215
16	41	66	91	116	141	166	191	216
17	42	67	92	117	142	167	192	217
18	43	68	93	118	143	168	193	218
19	44	69	94	119	144	169	194	219
20	45	70	95	120	145	170	195	220
21	46	71	96	121	146	171	196	
22	47	72	97	122	147	172	197	
23	48	73	98	123	148	173	198	
24	49	74	99	124	149	174	199	
25	50	75	100	125	150	175	200	

New Instruments							
301	326	351	376	401	426	451	476
302	327	352	377	402	427	452	477
303	328	353	378	403	428	453	478
304	329	354	379	404	429	454	479
305	330	355	380	405	430	455	480
306	331	356	381	406	431	456	
307	332	357	382	407	432	457	
308	333	358	383	408	433	458	
309	334	359	384	409	434	459	
310	335	360	385	410	435	460	
311	336	361	386	411	436	461	
312	337	362	387	412	437	462	
313	338	363	388	413	438	463	
314	339	364	389	414	439	464	
315	340	365	390	415	440	465	
316	341	366	391	416	441	466	
317	342	367	392	417	442	467	
318	343	368	393	418	443	468	
319	344	369	394	419	444	469	
320	345	370	395	420	445	470	
321	346	371	396	421	446	471	
322	347	372	397	422	447	472	
323	348	373	398	423	448	473	
324	349	374	399	424	449	474	
325	350	375	400	425	450	475	

New Literature								
501	526	551	576	601	626	651	676	701
502	527	552	577	602	627	652	677	702
503	528	553	578	603	628	653	678	703
504	529	554	579	604	629	654	679	704
505	530	555	580	605	630	655	680	705
506	531	556	581	606	631	656	681	706
507	532	557	582	607	632	657	682	
508	533	558	583	608	633	658	683	
509	534	559	584	609	634	659	684	
510	535	560	585	610	635	660	685	
511	536	561	586	611	636	661	686	
512	537	562	587	612	637	662	687	
513	538	563	588	613	638	663	688	
514	539	564	589	614	639	664	689	
515	540	565	590	615	640	665	690	
516	541	566	591	616	641	666	691	
517	542	567	592	617	642	667	692	
518	543	568	593	618	643	668	693	
519	544	569	594	619	644	669	694	
520	545	570	595	620	645	670	695	
521	546	571	596	621	646	671	696	
522	547	572	597	622	647	672	697	
523	548	573	598	623	648	673	698	
524	549	574	599	624	649	674	699	
525	550	575	600	625	650	675	700	

NEW LITERATURE

Surface Plate Calibration. New bulletin features article on "How to Calibrate Surface Plates in your Plant."—Collins Microflat Co., 2326 E. 8th St., Los Angeles 21, Calif.

Circle **690** on inquiry card.

Boring Heads. New 12-page Catalog 6B presents maker's six standard precision boring heads and patented adjusting principle for close tolerance boring.—Briney Mfg. Co., P. O. Box 2208, Pontiac, Mich.

Circle **691** on inquiry card.

Brass Forgings. New 32-page Catalog (Aug. 56) presents design, properties, and applications of maker's brass, bronze and aluminum hot-pressed forgings.—Titan Metal Manufacturing Co., Bellefonte, Penna.

Circle **692** on inquiry card.

Forgings, Castings. New 32-page Catalog FC4-Ed3 presents data on smooth hammered forgings, composite die sections, cast-to-shape tool steels, etc.—Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 22, Penna.

Circle **693** on inquiry card.

Selenium Rectifiers. New 2-page information sheet pictures and describes maker's air-cooled selenium rectifiers for cathodic protection against corrosion.—Corrosion Services, Inc., P. O. Box 7343, Tulsa, Okla.

Circle **694** on inquiry card.

Aluminum Handbook. New 176-page handbook tabulates and describes aluminum products in all its forms from wrought alloys, sheet, plate, wire, rod, bar, extrusions, tube and pipe, to casting alloys.—Aluminum Company of America, 1501 Alcoa Building, Pittsburgh 19, Pa.

Circle **695** on inquiry card.

Lathe Centers. New 18-page illustrated Catalog CD-56 on maker's line of "Red-E" cylindrical grinding machine, lathe centers, and grinder dogs. —Ready Tool Co., 554 Iranistan Ave., Bridgeport 5, Conn.

Circle **696** on inquiry card.

MISCELLANEOUS

Drafting Room Aids. New 6-page folder describes maker's "Stanpatches" and "Stanpatch" cellulose acetate tapes for repairing tracings, drawings, blueprints, etc.—Stanpat, Whitestone 57, N. Y.

Circle **697** on inquiry card.

Work Benches and Accessories. Three new 2-data sheets describe maker's work center accessories; 6, 8 and 10 position work centers; work center benches, etc.—Alden System Co., Alden Res. Center, Westboro, Mass.

Circle **698** on inquiry card.

Hard Rubber Products. New 4-page Brochure E285 presents application and characteristics charts and technical molding tolerances of maker's hard and resin rubbers.—Stokes Molded Products Div. of Electric Storage Battery Co., Taylor at Webster Sts., Trenton 4, N. J.

Circle **699** on inquiry card.

Batteries. New 6-page folder Form 5916 describes maker's line of Exide-Manchex batteries used for stationary power services.—Exide Industrial Div., Electric Storage Battery Co., Box 8109, Phila. 1, Pa.

Circle **700** on inquiry card.

Homogenizer-Mixer. New 8-page Catalog 402-R-2 describes maker's high-speed, high-shear homogenizer-mixer for blending and homogenizing of paints, pharmaceuticals, cosmetics, heavy chemicals, etc.—Gifford-Wood Co., Graybar Bldg., New York, N. Y.

Circle **701** on inquiry card.

Nameplates. New 2-page bulletin presents maker's "Namettes" specially-styled nameplates.—Berglund-Swenson Co., Inc., 554 Elm St., Arlington, N. J.

Circle **702** on inquiry card.

Electronics Handbook. New 64-page Electronics Data Handbook presents collection of formulas and data used in radio and industrial electronics. —Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.

Circle **703** on inquiry card.

Chemical Containers. New 8-page bulletin presents maker's standard and custom "Agilene" corrosion-proof tanks and containers.—American Agile Corp., P. O. Box 168, Bedford, Ohio.

Circle **704** on inquiry card.

Radiochemicals. New 22-page catalog presents maker's radioactive materials available from stock.— New England Nuclear Corp., 575 Albany St., Boston, Mass.

Circle **705** on inquiry card.

Ultrasonic Cleaner. New 2-pag Bulletin S-10 presents maker's new, small, ultrasonic cleaning apparatu for bench-top washing of delicate, intricate parts that must be "surgically" clean.—Branson Ultrasoni Corp., 37 Brown House Road, Stamford, Conn.

Circle **706** on inquiry card.

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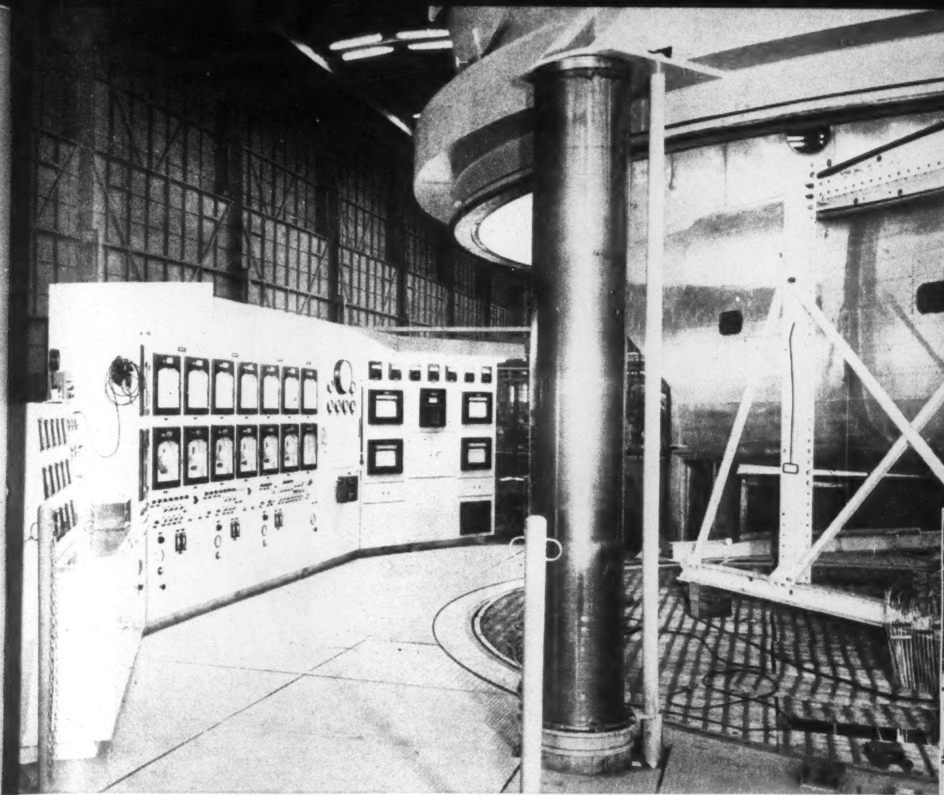
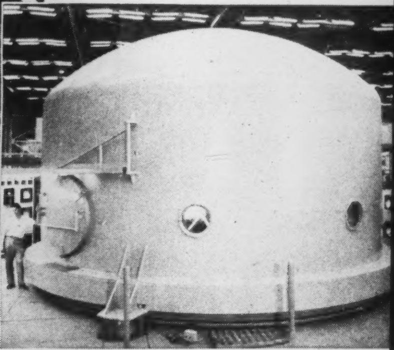


From one control panel altitude, ram, or bleed air systems can be controlled manually or automatically. Nearly 200 variables can be measured during a single test run.



This mammoth altitude chamber can accommodate airplane test articles as large as 12 feet high x 18 feet long x 12 feet wide.

F & P CONTROL SYSTEM BRINGS THE STRATOSPHERE DOWN TO EARTH

Flight Conditions Simulated from Sea Level to 120,000 Feet at Douglas Aircraft Company, Inc.

Fischer & Porter instrumentation automatically controls all the essential variables in the operation of the new altitude test chamber at Douglas Aircraft Company, Inc., Tulsa, Oklahoma. Altitude, weather and speed are *automatically controlled* to simulate an airplane's actual flight conditions during take-off, stratospheric cruising, and landing.

All instrumentation is designed so that altitude, ram and bleed air systems can be controlled 3 ways . . . manually, automatically under steady state conditions, or automatically under program control conditions. Altitudes from sea level to 120,000 feet, temperatures from -100°F. to +1000°F. and pressures from 0 psia to 250 psia are easily obtained. During a single test run, nearly 200 measurements of temperature, pressure, flow, humidity, vacuum, and altitude are possible.

Fischer & Porter has successfully furnished package instrumentation on similar aircraft test facilities throughout the country. In your industry F&P's experience in systems engineering, control, field testing, field supervision and field start-up can be of service to you.

Write today for complete information.

FISCHER & PORTER CO. Hatboro, Pa.

COMPLETE PROCESS INSTRUMENTATION

For more information circle **47** on inquiry card.

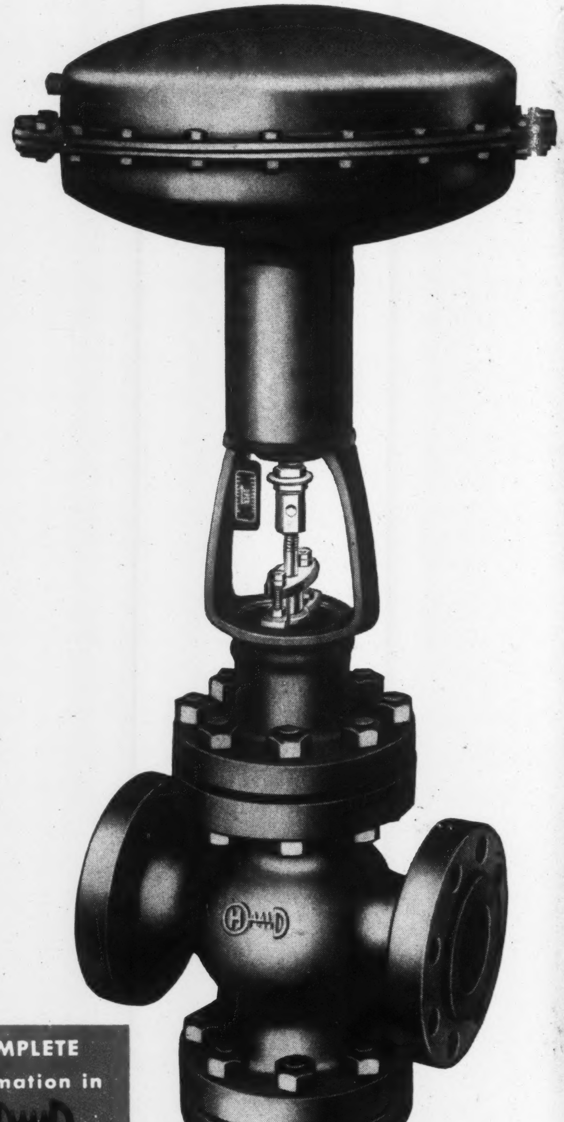
LA 1128

HIGH ABOVE ALL OTHER STANDARDS!

The Newly MODIFIED* Hammel-Dahl Standard 3000 Series CONTROL VALVE Now incorporates the following *additional* features:

1. Retained gasket design for bonnet and blindhead joints.
2. One-piece construction bonnets and blindheads.
3. Cast ductile iron open-yoke.
4. Pressed steel diaphragm casings and steel spring barrel.
5. Four spring ranges interchangeable in any superstructure: 0-30, 3-15, 5-25, or 6-30 PSIG.
6. Superstructure removable without disturbing the stuffing box or the gland flange bolting.
7. Oversize diaphragm case interchangeable with standard case.
8. Plug stem — spring stem split — coupled. (Simplifies assembly and disassembly, and prevents twisting of the plug stem.)
9. Integral mounting bracket for all makes of positioners on all superstructures.
10. Calibrated hysteresis test of every valve. Record supplied on request.

**Available as soon as our current valve stock is depleted.*



COMPLETE Information in H-D Bulletin 101-D

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SALES OFFICES IN ALL PRINCIPAL CITIES
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CANADIAN MANUFACTURING AFFILIATE—GUELPH ENGINEERING CO., GUELPH, ONT.

For more information circle **97** on inquiry card.

INSTRUMENTS and AUTOMATION

1957 handbook & buyers' guide

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HOW IMPROVED INSTRUMENTATION IS SOLVING INDUSTRY PROBLEMS

A leak so small that it would take 120 years for a thimbleful of air to seep through can be detected by a new General Electric leak detector! This is just one example of how new G-E instruments are solving problems in industry.

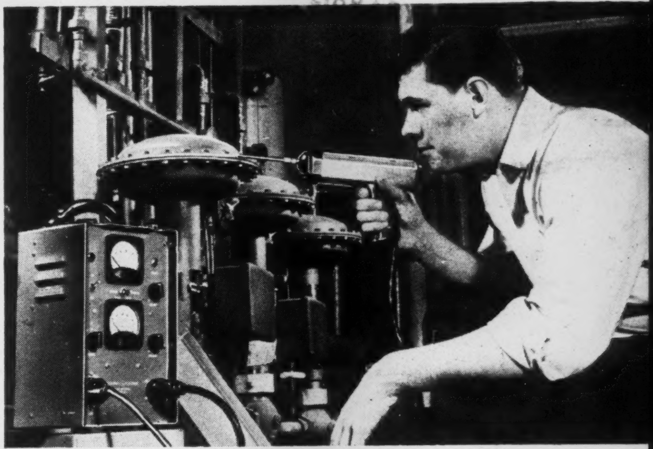
MORE THAN 300 DIFFERENT INSTRUMENTS have been developed by G.E.'s Instrument Department to help industry reduce costs, save time, and improve quality, both in production and development. Whatever your problem, there are G-E instruments to help you.

FREE! NEW G-E CATALOG

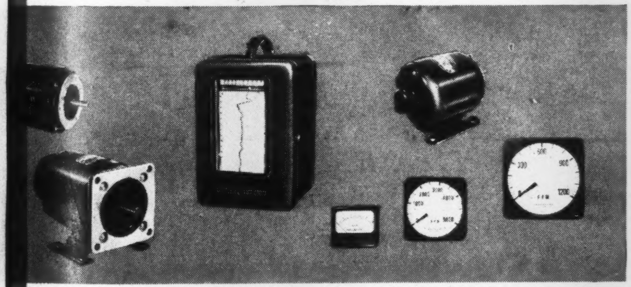
FOR INFORMATION on how G.E.'s wide line of modern instruments can solve your problems, contact your nearest G-E Apparatus Sales Office, or write for catalog GEC-1016 to Section 585-49, General Electric Company, Schenectady 5, N. Y.

For more information circle **1** on inquiry card.

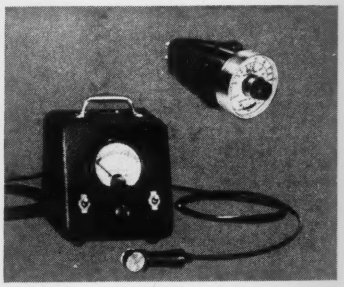
GENERAL ELECTRIC



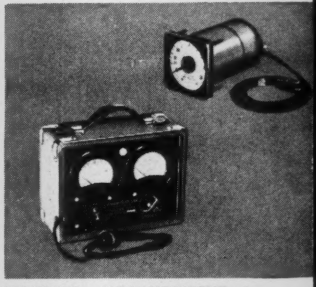
LEAK DETECTION problems of many kinds are solved with General Electric's complete line of leak-detection equipment—the H-1 halogen-type (above), new mass spectrometer-type, and the new leak standard, for portable or automatic-production testing.



SPEED MEASUREMENT equipment for virtually all applications is offered by General Electric. Choose the right equipment to solve your problems from General Electric's extremely wide selection of tachometer generators and indicating and recording instruments.



THICKNESS MEASURING of non-magnetic materials on a steel base is done quickly and accurately with General Electric's line of thickness gages.

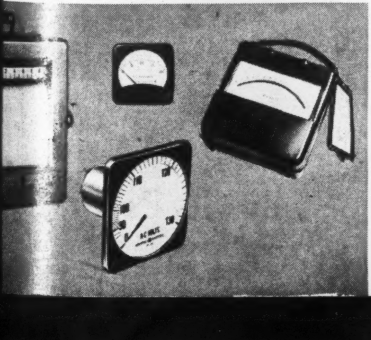


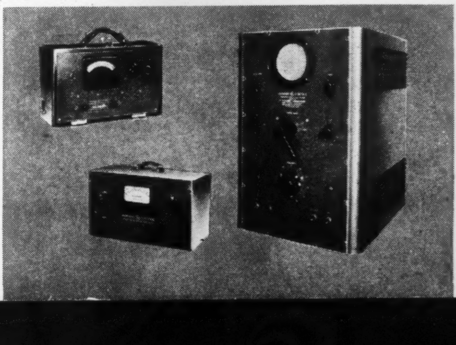
VACUUM MEASUREMENT is simplified with G.E.'s unique molecular vacuum gage and thermocouple vacuum gage.

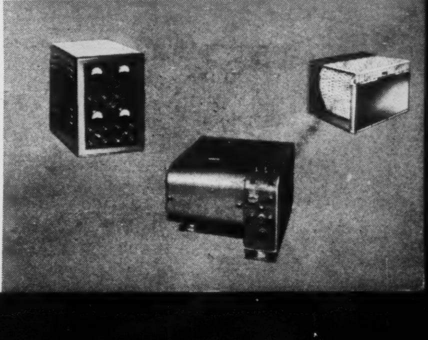
FOR ELECTRICAL QUANTITIES, there are new portable instruments, switchboard and panel instruments, and recorders, for every indicating and recording problem.

INSULATION TESTING instruments by G.E. help provide maximum quality in all electrical equipment. For impulse, high-potential, or insulation-resistance testing, G-E instruments are fast and highly reliable.

DYNAMIC MEASURING EQUIPMENT needs are met by G.E.'s new and improved general-purpose oscillographs, strain-gage amplifiers, and rapid oscillogram developer.







For the Measurement of

SOLAR RADIATION

Eppley Pyrheliometers are used for solar radiation measurements at ninety-eight weather stations in the continental United States, Canada, Alaska, Greenland, Iceland, Caribbean Sea, and the Pacific Ocean. Sixty-two of these stations are under the direction of the United States Weather Bureau. The Eppley Pyrheliometer was adopted as standard equipment by the Weather Bureau after considerable experimentation. It was found to be the best instrument so far tested by the Bureau.

Used in conjunction with a suitable recorder, the Eppley Pyrheliometer will provide an accurate and reliable record of total solar and sky radiation on a horizontal surface.

Bulletin No. 2 on Request

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THE EPPLEY LABORATORY, INC.

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There's a standard PERKIN model for your every need!

In addition to the 28 volt models featured at the right, the following units are also available:

OTHER 28 VOLT MODELS

Model	Volts	Amps	Reg.	AC Input (60 cps)	Ripple rms
28-5VFM	0-32 V	5	20% (24-32 V range)	115 V 1 phase	2%
28-10WX	24-32 V	10	±½%	100-125 V 1 phase	1%
28-15VFM	0-32 V	15	20% (24-32 V range)	115 V 1 phase	6%
28-50WX	24-32 V	50	±½%	230 V* 3 phase	1%
MR2432-200	24-32 V	200	±½%	230 V* 3 phase	1%
MR2432-300	24-32 V	300	±½%	230 V* 3 phase	1%
MR2432-500	24-32 V	500	±½%	230 V* 3 phase	1%

*±10%. Also available in 460 V ±10% AC input. Will be supplied with 230 V input unless otherwise specified.

6, 12, 115 VOLT (NOMINAL) MODELS

Model	Volts	Amps	Reg.	AC Input (60 cps)	Ripple rms
6-5WX	6 ±10%	5	±1%	95-130 V 1 phase	1%
6-15WX	6 ±10%	15	±1%	95-130 V 1 phase	1%
6-40WX	6 ±10%	40	±1%	95-130 V 1 phase	1%
12-15WX	12 ±10%	15	±1%	95-130 V 1 phase	1%
115-5WX	115 ±10%	5	±½%	95-130 V 1 phase	1%
MR15125-5	15-125	5	±1%†	95-130 V 1 phase	1%†
6125-25**	115-125	25	1½-4%	230/460 V 3 phase	5%

**Germanium Rectifier Unit †Increases to 2% @ 15 V.

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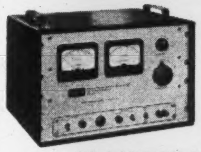


Model MR532-15A

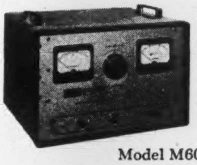
2-36 VOLTS @ 15 AMPS SPECIFICATIONS

Regulation: 5-32 Volt Range: ±½%
2-5 Volt and 32-36 Volt Range: ±2%

AC Input: 105-125 Volts, (for 2-32 V.DC), 110-125 V, (for 32-36 V.DC), 1 phase, 60 cps (8 amps)

Ripple: 1% rms max. (@ 36 volts and full load. Increases to 2% @ 2 volts and full load).

Remote Sensing • Vernier Control



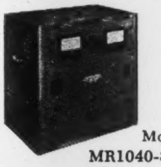
Model M60V

0-32 VOLTS @ 25 AMPS SPECIFICATIONS

Regulation: ±1% @ 28 Volts (Regulation increases to 2% over range of 24-32 volts; does not exceed 2 volts over 4-24 volt range. Not stabilized for AC line changes.)

AC Input: 115 Volts, 1 phase, 60 cps (12 amps).

Ripple: 1% rms (@ 32 volts and full load—2% rms max. @ any voltage above 4 volts).



Model MR1040-30A

5-40 VOLTS @ 30 AMPS SPECIFICATIONS

Regulation: ±1% (over entire 5-40 volt range)

AC Input: 100-130 Volts, 1 phase, 60 cps

Ripple: 1% rms

Model 28-30 WXM

24-32 VOLTS @ 30 AMPS SPECIFICATIONS

Regulation: ±½%

AC Input: 100-125 Volts, 1 phase, 60 cps (20 amps). (Unit rated for DC output of 28 volts ±10% for 95-130 volt input.)

Ripple: 1% rms

Model MR2432-100XA

24-32 VOLTS @ 100 AMPS SPECIFICATIONS

Regulation: ±½%

AC Input: 208, 230 or 460 Volts, ±10%, 3 phase, 60 cps (14, 12 and 6 amps respectively). 230 volt input will be supplied unless otherwise specified.

Ripple: 1% rms

Wire factory collect for prices...Write for catalog.

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LEADER IN TUBELESS MAGNETIC AMPLIFIER REGULATION

Representatives in Principal Cities

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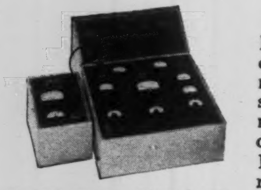
HICKOK ELECTRONIC Test Instruments HICKOK

9 TUBE TESTERS FILL ALL REQUIREMENTS



MODEL 7001 MODEL 700

LABORATORY TUBE TESTER

All Voltages Variable and Metered

Model 700: Most complete and accurate Tube Tester. Covers wide ranges of values to duplicate the results in tube manuals. This instrument is invaluable for electronic developmental and research work. Model 7001: Null Reading Apparatus, for use with the Model 700 to obtain bridge type Null readings with an accuracy of 1%. Most complete and accurate Tube Tester available.

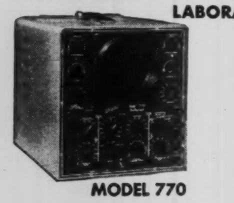
MODEL 539B

PORTABLE TUBE TESTER

Most Accurate

Model 539B: Features simplicity of operation in providing a complete and accurate evaluation of electron tubes. Has Mutual Conductance circuits, 6 micromho ranges, 4 AC Signal voltages, metered line voltage, metered grid voltage and other important features.

7 OSCILLOSCOPES MEET SPECIALIZED REQUIREMENTS



MODEL 770

LABORATORY CATHODE RAY OSCILLOSCOPE

Wide Range . . . Versatile

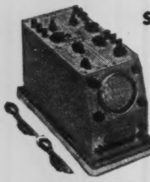
Model 770: Provides unusually wide range of DC to 5 MC. 10 M.V. RMS per inch sensitivity. Built-in calibrating voltages. New flat-faced tube. Illuminated calibrated screen. Mumetal shield. Shock mounted. This highly stable 'Scope is laboratory quality throughout.

MODEL 670R

TECHNICIANS' OSCILLOSCOPE

5-Inch Portable or Rack Mount

Model 670R: DC to 600 KC, within 3 db. Useable to beyond 2MC. .015 RMS volts per inch sensitivity. Sweep circuit oscillator; 3 cycles to 50 KC. Fixed sweep frequencies; 30 and 7875 cycles. Input impedance: vertical, 2.2 megohms—15 mmf; horizontal, 1 megohm—35 mmf. Features illuminated calibrated screen. Also available in portable case as Model 670A.

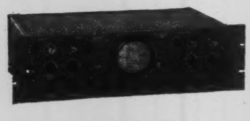


MODEL 385

SMALLER SIZE LABORATORY OSCILLOSCOPE

3-Inch Portable

Model 385: DC to 4 MC, within 3 db, 0.75 RMS volts per inch sensitivity. Sweep circuit oscillator; 3 cycles to 50 KC. Input impedance: vertical and horizontal amplifiers; 2.2 megohms—25 mmf. Features replaceable circuit sections. High quality throughout. Also available in portable, moisture-proof, weather-proof aluminum carrying case as preferred by field engineers.



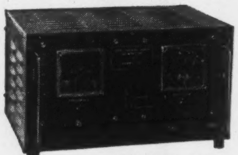
MODEL 387R

INDUSTRIAL LABORATORY OSCILLOSCOPE

3-Inch Rack Mount

Model 387R: Popular rack-mount style in an accurate 3-inch oscilloscope. Features identical vertical and horizontal amplifiers. DC to 500 KC response. 10 MV RMS sensitivity. Designed to permit versatile use in all phases of electronic work.

11 GENERATORS WITH SPECIALIZED FUNCTIONS



MODEL 710

SINE-SQUARE WAVE GENERATOR

For Laboratory & Industrial Use

Model 710: Provides an accurately calibrated source of sine wave and square wave functions over a wide frequency range. Sine wave total harmonic distortion below 1%. Hum level better than 90 db down. Square wave rise time less than .1 Microsecond. 20 cycles to 1 MC in five ranges on both sine and square waves.

MODEL 295X

MICROVOLT SIGNAL GENERATOR

125 KC to 175 MC on Fundamentals

Model 295X: Ideal for mobile radio and other communication equipment design and maintenance. Output 0.1 microvolt to 100,000 microvolts. 125 KC to 175 MC continuous on fundamentals. 400 cycle modulation—approximately 30%. Attenuation down to 0.1 microvolt — no external attenuator pad required. Vernier Control permits hairline settings. Silverplated copper cage shielding. Test leads are furnished.

5 VTVM and VOM INSTRUMENTS

MODEL 209A

TRUE VACUUM TUBE

Laboratory Size and Accuracy

Model 209A: Contains large 9" meter with zero-center scale. Highly accurate for servicing industrial electronic equipment. DC Volts: 0-1200 in 6 ranges. AC Peak-to-Peak Voltage: 0-1200 V. in 6 ranges. Capacitance 0.1 to 10,000 MMF in 2 ranges, 0-1000 MF in 5 ranges. 50 MH to 100 henries. 0.1 ohm to 10,000 megohms in 7 ranges.

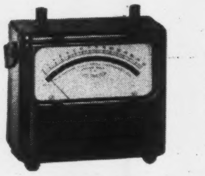
MODEL 455

NEW VOLT-OHM-MILLIAMMETER

You Can't Burn It Out!

Model 455: New design portable VOM. Includes all practical ranges. Features patented protection system which protects both the meter and associated circuits from damage due to accidental overload. Quality designed for utility and attractiveness. Neoprene carrying case available.

HIGHLY ACCURATE DC and AC PORTABLE INSTRUMENTS



MODEL 14

Ammeters, Milliammeters, Microammeters, Voltmeters, Millivoltmeters, Volt-Ammeters. Thermometers are contained in a phenolic case lined with heavy steel shell which shields from the effects of stray magnetic fields. Scale divisions are spaced equal distances apart. Accuracy within ½ of 1%. On special order, Model 14 can be supplied with a calibration chart to provide accuracy to 0.2%. Also available is a complete line of pocket portables.

METERS

The many special movements developed by HICKOK are: electrodynamometers, self-contained frequency meters, galvanometers, true logarithmic deflections, special curves for special purposes and ruggedized designs for highest shock tests. Full technical information on the complete line of HICKOK instruments and test equipment is available on request. Kindly list details of your requirements and ask for Catalogs No. 32 and 33.

THE HICKOK ELECTRICAL INSTRUMENT COMPANY

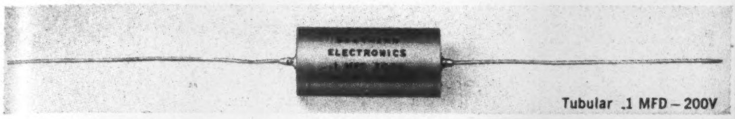
10514 DUPONT AVENUE • CLEVELAND 8, OHIO

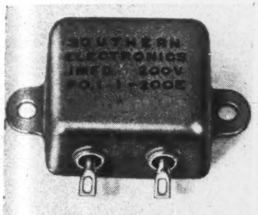
HIGHEST QUALITY ELECTRICAL AND ELECTRONIC TEST INSTRUMENTS

For more information circle 4 on inquiry card.

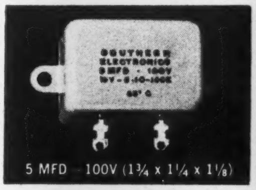
where precision counts—it's S.E.C. first!

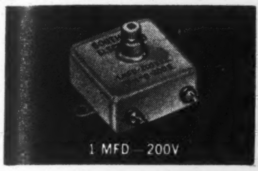
PLASTIC PRECISION CAPACITORS

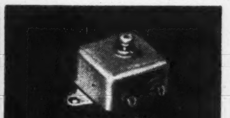

Tubular .1 MFD – 200V

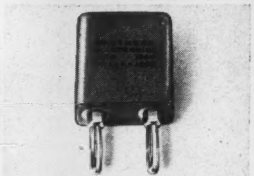

.1 MFD – 200V

10 MFD ± 1% 200V (4 7/16 x 3 1/16 x 2 1/8)


5 MFD 100V (1 3/4 x 1 1/4 x 1 1/8)


1 MFD – 200V


Adjustable (1 3/16 x 1 1/16 x 1 11/16)


Plug in (1 MFD – 150V)

1. POLYSTYRENE

with these outstanding properties:

- Tolerances as close as 0.1%
- Insulation Resistance as HIGH as 1 x 10¹¹
- Dielectric Absorption as LOW as .0001
- Dissipation Factor as LOW as .0002
- Temperature Coefficient… 100PPM per °C
- Stability as close as .05% drift in 1 yr.
- Voltage Derating… none to 170°F.
- Hermetically sealed for enduring accuracy!

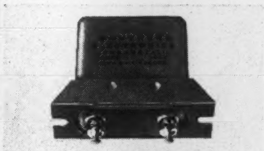
also available:

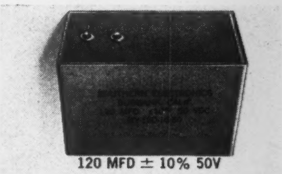
- Many other case styles or mounting brackets
- Any capacitance from .001 to 50 MFD (incl. special values)
- Voltages from 50 to 5000

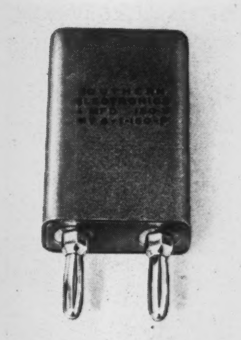
2. POLYESTER

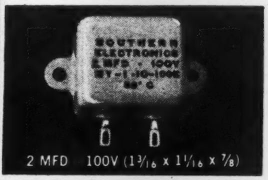
with these outstanding properties:

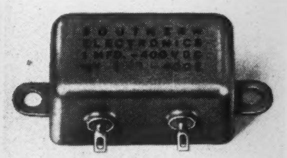
- Tolerances as close as 1%
- Insulation Resistance as HIGH as 1 x 10¹¹
- Dielectric Absorption as LOW as .001
- Dissipation Factor as LOW as .003
- Temperature Coefficient… 800 PPM per °C
- Temperature range…… to 150°C.
- Hermetically sealed for enduring accuracy!

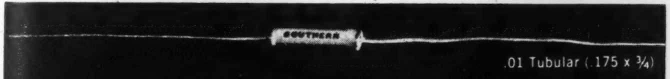

4 MFD – 300V (2 x 2 x 1)


120 MFD ± 10% 50V

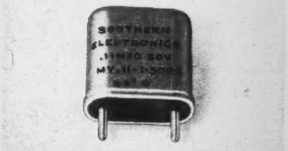

Plug in (4 MFD – 150V)

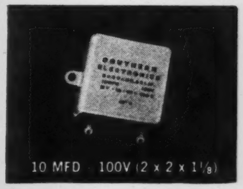

2 MFD 100V (1 3/16 x 1 1/16 x 7/8)

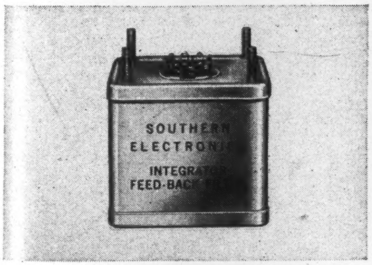

1 MFD – 400V (1 3/4 x 1 1/4 x 1)


.01 Tubular (.175 x 3/4)

.1 Tubular (.312 x 1)


Printed Circuit Small .11 MFD – 50V


10 MFD 100V (2 x 2 x 1 1/8)



3. RC NETWORKS

- Close tolerances
- Hi-grade precision resistors
- Potted units
- Meet mil specs

Many other types of precision RC Networks available!

S.E.C. PRODUCTS HAVE BEEN SPECIFIED IN SEVERAL MISSILE APPLICATIONS!

SOUTHERN
ELECTRONICS
Corporation

POLYCON
SEC
MYCON

For your most exacting requirements —always specify S.E.C.

239 West Orange Grove Ave., Burbank, California

PIONEERS IN CUSTOM PRECISION CAPACITOR ENGINEERING

For more information circle **5** on inquiry card.

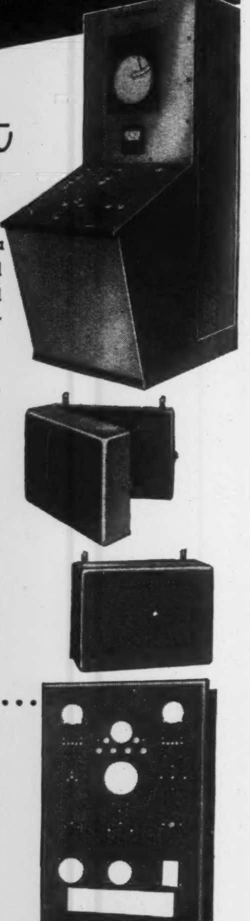
ELECTRICAL ENCLOSURES

Custom-Built by KIRK & BLUM

ONE or one thousand, from a small timer case to a huge control panel, Kirk and Blum produces all kinds of metal enclosures, quickly and economically.

Complete facilities for fabrication of sheet steel, plate, light structurals, stainless, aluminum, monel, and other alloys.

Send your prints to Kirk and Blum for prompt quotation. More detailed information is available in new literature describing fabrication facilities and experience. Write to: The Kirk and Blum Mfg. Co., 3110 Forrer Street, Cincinnati 9, Ohio.



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KIRK & BLUM
METAL FABRICATION

For more information circle 6 on inquiry card.

THE 1957 I&A HANDBOOK & BUYERS' GUIDE

Part Two of the Two-part October 1956 issue of Instruments and Automation

CONTENTS

1. *Index to Instruments and Apparatus.* In this section, products are listed alphabetically. Under each heading appear the names of the manufacturers of this equipment (and of the sole representatives of such manufacturers). *Pages 57 to 248.*

2. *Directory of Manufacturers and sole representatives,* with complete addresses and brief descriptions. *Pages 249 to 289.*

3. *Handbook Data on Temperature and Pressure.* Nineteen tables of data often needed by the instrument specialist. *Pages 240 to 295.*

ADVERTISERS' INDEX

Ace Electronics Associates 30
Acme Gauge & Instrument Co., Inc. 169
Acromark Company 145
Aero Research Instrument Company, Inc. 244
Aircraft-Marine Products, Inc. 47
Alden Products Company 80
Alina Corporation 137
Alpha Molykote Corporation 135
Alteneder & Sons, Theo. 222
American Chain & Cable Company 41
American Laubscher Corporation 139
American Machine and Metals, Inc. 171
American Paulin System 68
American Thermo-Electric Co. 217
American Time Products, Inc. 46
Amglo Corporation 149
Amperite Co., Inc. 187
Amphenol Electronics Corporation 34
Amthor Testing Instrument Co., Inc. 131
Annin Company 39
Annis Company, R. B. 140
Applied Research Laboratories 198
Arnoux Corporation 168, 214
Assembly Products, Inc. 176, 182, 185, 213
Associated Specialties Co. 166
Associated Spring Corporation 200
Atmosphere Control Company, Inc. 103
Automatic Electric Sales Corporation 81
Automatic Temperature Control Co., Inc. 195, 205, 221, 222

Bache & Company, Semon 123
Bailey Meter Company 70, 84, 89, 90, 110, 112, 115, 118, 132, 158, 169, 175, 177, 178, 181, 197, 210, 211, 229, 232
Baird Associates-Atomic Instrument Co. 118
Ballantine Laboratories, Inc. 240
Barnes Development Company 72, 197
Barton Instrument Corporation 110
Bellmore Gear Corp. 119
Berkshire Laboratories 225
Beta Corporation 237
B & F Instruments, Inc. 58, 71
Biddle Co., James G. 114, 127, 189, 209
Biggs Co., Carl H. 165
Bin-Dicator Co. 132
Bird & Co., Inc., Richard H. 128
Black, Sivalls & Bryson, Inc. 14-15
Bora Corporation, George W. 53
Boulin Instrument Corporation 209
Bourns Laboratories 51
Brainin Co., C. S. 86
Branson Instruments, Inc. 220
Branson Ultrasonic Corp. 82
Briggs Filtration Co. 58
Bristol Company 89, 159, 164, 169, 172, 176, 211, 216, 218
British Electronic Sales Co., Inc. 168
Brooks Rotameter Company 113
Brush Electronics Company 6-7
Buffalo Meter Co. 112
Burgess Battery Company 69
Bushnell & Co., Inc., D. P. 191
B/W Controller Corporation 132

Canadian Radium & Uranium Corp. 161
Canfield Rubber Co. 191
Cannon Electric Company 87
Carter Motor Co. 100
Cash Company, A. W. 56
Central Scientific Company 231
Circon Component Company 85
Clifton Precision Products Company, Inc. 206-207
Cobehn, Inc. 83
Cohn Corp., Sigmund 243
Coleman Engineering Company, Inc. 94
Collectron Corporation 196
Colvin Laboratories, Inc. 257
Commercial Iron Works 155
Conoflow Corporation 173, 175, 230, 232
Counter and Control Corporation 93
Crawford Fitting Co. 107
Crescent Insulated Wire & Cable Company 228
Crystal Glass Tube & Cylinder Co. 191
Curtis Laboratories, Inc. 154

Dahl Company, George W. 233
Davis Instruments 116
Daystrom Pacific Corp. 59
Del Electronics Corp. 224
Denison Mfg. Co., R. B. 203
Development Engineering Company 103
Dialight Corporation 161
Dice Company, J. W. 8
Dixon Incorporated, William 223
Dragon Engineering Co. 235
Durant Mfg. Co. 92
Dwyer Mfg. Co., F. W. 99, 144
Dyna-Empire, Inc. 140

Eastern Specialty Co. 160
Ebert Electronics Corp. 188
Edcliff Instruments 210
Eder Instrument Co. 211
Edison, Incorporated, Thomas A. 186
Eldema Corporation 162
Electric Auto-Lite Company 54
Electric Hotpack Company, Inc. 157
Electro Development Co. 196
Electro Products Laboratories 145
Electro-Mechano Co. 208
Electro-Medical Laboratory, Inc. 78
Electronic Associates, Inc. 55
Electronic Instrument Co., Inc. (EICO) 79
Electro-Tech Equipment Company 102
Ellis Associates 202
Ellison Draft Gage Co. 99
El Products Corp. 150
Emery Company, A. H. 242
Empire State Laboratories, Inc. 102
Environmental Equipment Co. 103
Eppley Laboratory, Inc. .... Inside Front Cover, 201
Esco Products 261
Evaporated Metal Films Corp. 148
Ewald Instruments 243

Federal Products Corporation 37
Federal Screw Products Inc. 193
Fenway Machine Company, Inc. 10, 138, 263
Ferner Co., R. Y. 51
Fineisen, A. R. 138
Fish-Schurman Corp. 121
Fitzpatrick Electric Supply Co. 244
Flow Corporation 110
Foxboro Company 16-17
Freed Transformer Co., Inc. 92, 189

Gaertner Scientific Corp. 98
Gallien & Son, R. P. 137
Geier & Bluhm, Inc. 134
General Devices, Inc. 204
General Electric Company .... Front Cover
General Precision Laboratory Incorporated 212

Continued on page 8

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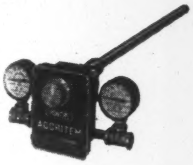
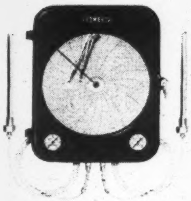
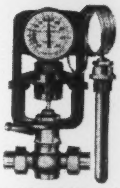
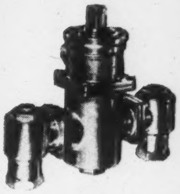
the Best line

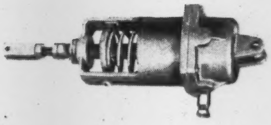
POWERS TEMPERATURE, PRESSURE AND HUMIDITY CONTROL SYSTEMS


ACCRITEM
Temperature
Regulator
(Compressed Air
or Water Operated)


Series 100
Recording
Controller

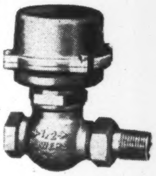

No. 11 Indicating
Temperature
Regulator
(Self Operating)

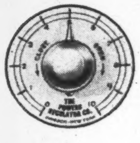

Type N
HYDROGUARD
Thermostatic
Water Mixer

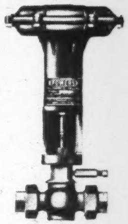

POWERSTROKE
Air Motor

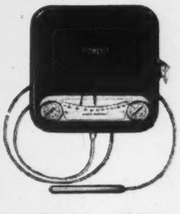
the Broad line

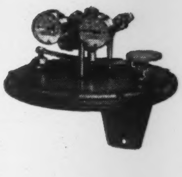
POWERS CONTROLS FOR EVERY NEED


Packless
Control Valve


Gradual
Air Switch


FLOWRITE
Control Valve


Series 100
Indicating
Controller


Pressure
Controller

Dial
Thermometer

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general catalog

POWERS

SPECIALISTS IN AUTOMATIC CONTROL SINCE 1891

The Powers Regulator Company, Skokie 10, Illinois

For more information circle **7** on inquiry card.

BRUSH ELECTRONICS

RECORDING SYSTEMS

provide full range instrumentation

Here are *complete* recording systems—designed to give you the greatest flexibility in measurement problems. For example:

- A greater range of signals can be recorded with optimum resolution than with any other direct writing Oscillograph. New Brush Oscillographs have the widest chart speed range available—from 10″ per day to 10″ per second.
- The units are designed for physical interchangeability. The 4 and 6-channel Oscillographs are mounted in identical chassis. Systems can be mounted in standard 19-inch racks, or bench top or floor consoles.
- Coordinated *system* design means that one system can meet many requirements. You can cover the full range of direct writing Oscillograph application with Brush equipment.
- Accessories available: event markers, timing markers and remote control units.

WHAT IS YOUR MEASUREMENT PROBLEM?

These Brush instruments can simplify
your testing and development work.

FOR ELECTRICAL MEASUREMENTS

Amplifiers for systems to measure and record voltages and currents.

BL-530 Dual Channel D. C. Amplifier
BL-533 Portable D. C. Amplifier
BL-536 Six-Channel Plug-In D. C. Amplifier
BL-550 D. C. Amplifier, High Gain
BL-560 Servo-Analyzer
BL-905 A. C. Amplifier, High Gain
BL-954 A. C. Pre-Amplifier, High Gain

FOR PHYSICAL MEASUREMENTS

Amplifiers for measuring stress, strain, torque, force, pressure, etc.

BL-520 Universal Amplifier (Tension Analyzer)
BL-350 Input Box (Resistive)
BL-345 Input Box (Inductive)

DIRECT WRITING OSCILLOGRAPHS

Portables

BL-201 Single Channel Direct Inking
BL-202 Double Channel Direct Inking
BL-221 Single Channel Direct Inking and Electric
BL-222 Double Channel Direct Inking and Electric
BL-274 Four Channel Direct Inking and Electric
BL-276 Six Channel Direct Inking and Electric

Rack Mounting

BL-261 Single Channel Direct Inking and Electric
BL-262 Double Channel Direct Inking and Electric
BL-254 Four Channel Direct Inking
BL-256 Six Channel Direct Inking
BL-264 Four Channel Direct Inking and Electric
BL-266 Six Channel Direct Inking and Electric

FOR RESISTANCE-WELDING MEASUREMENTS

For measuring and recording welding variables.

BL-213 Welding Analyzer*

FOR SOUND MEASUREMENTS

BL-1014 Beat Frequency Oscillator
BL-1602 Frequency Distortion Measuring Bridge
BL-1606 Vibration Pickup Pre-Amplifier
BL-2002 Heterodyne Voltmeter
BL-2105 Frequency Analyzer
BL-2109 Third Octave Spectrum Analyzer
BL-2304 High Speed Level Recorder
BL-2370 Polar Diagram Recorder
BL-2601 Microphone Amplifier
BL-3302 Frequency Response Recorder
BL-4002 Sound Absorption Measuring Equipment
BL-4109 Artificial Ear
BL-4111 Condenser Microphone
BL-4119 Microphone Calibration Apparatus
BL-4211 Constant Sound Pressure Source
BL-4210 Artificial Voice
BL-4305 Vibration Pickup
BL-4707 Automatic Frequency Response Tracer

FOR METAL MEASUREMENTS

BL-110 Surfindicator*
BL-140 Metal Monitor

PRODUCTION INSPECTION EQUIPMENT

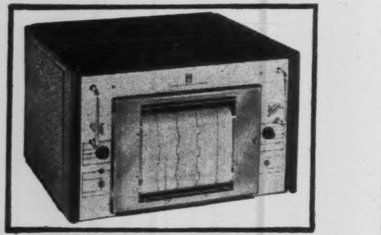
BL-1504, BL-1506 Impedance Deviation Test Bridge
BL-2423 Megohmmeter and D. C. Tube Voltmeter

DIGITAL DECADE COUNTERS

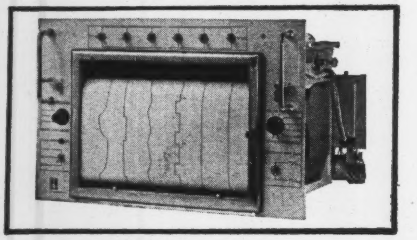
High speed counters, accept pulses at rates from zero to 100,000 counts per second.

(*Trade-Mark)

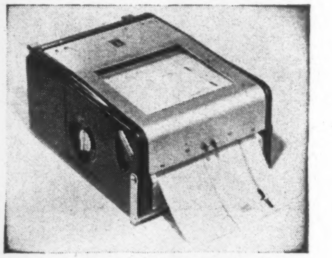
OSCILLOGRAPHS



Model BL-254, Four-Channel.



Model BL-266, Six-Channel.

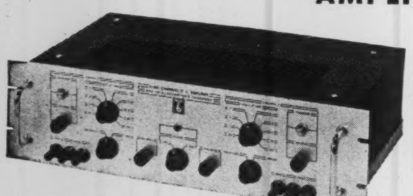


Model BL-274, Portable Four-Channel

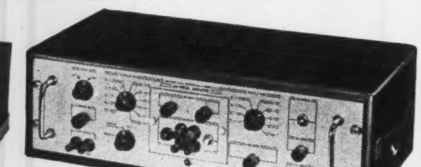
Oscillographs for standard rack or bench top console. The 4-channel unit can be expanded to six channels to meet your changing requirements. Electrically controlled chart drive transmission—standard in all multi-channel oscillographs—permits instantaneous switching and remote control. Choice of 8 or 16 chart speeds. Choice of ink or electric.

Portable Oscillographs feature light weight and small size; they are self-contained. Equipped with electrically controlled chart drive transmission — 16 chart speeds available.

AMPLIFIERS



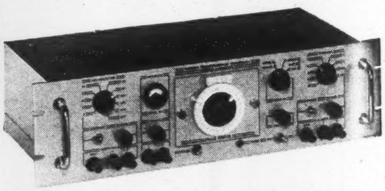
Model BL-530, Rack Mounting



Universal* Amplifier **BL-520**; with Portable Case **BL-380**.

Brush Amplifiers feature low drift scale expansion, choice of single ended or balanced inputs. May be operated on a wide range of line voltages and frequencies. New Universal* Amplifier can be used with *both* resistive or inductive transducers. When used with Brush Direct Writing Oscillograph, permits measurement and direct recording of physical phenomena such as strain, stress, torque, force, etc. Amplifier includes direct coupled section that may be used separately for voltage and current measurements.

SERVO-ANALYZER AMPLIFIER



New amplifier, coupled to a Brush direct writing oscillograph, provides a package unit to record performance of servo systems in carrier frequency range of 50 to 10,000 cps. Offers exceptional frequency response, flexibility, high accuracy.

BRUSH ELECTRONICS COMPANY

3405 Perkins Avenue, Cleveland 14, Ohio

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6
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DIVISION OF

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BRUSH ELECTRONICS

SOUND & NOISE INSTRUMENTATION

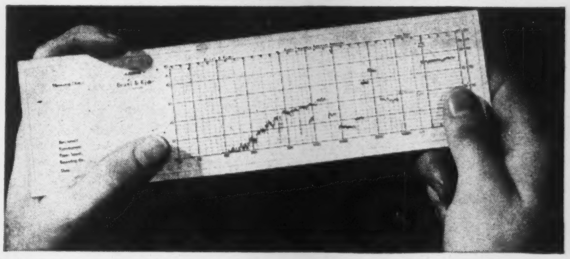
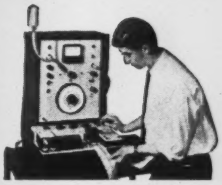


Chart record produced by the Brush Spectrum Recorder presents a complete frequency and noise level analysis. It is an example of the way Brush instrumentation can aid *your* analysis of noise, vibration or strain.

- All sounds from 14 cycles to 36,000 cycles per second automatically scanned and recorded by the Brush Spectrum Recorder to eliminate laborious plotting of data.
- Measurements made in one-third octave steps, to positively identify frequencies.
- Complete recording through the complete frequency range made in 21 seconds, to save valuable engineering time.

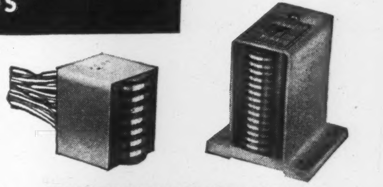
The Spectrum Recorder is one unit in the most complete line of noise and vibration instrumentation available (manufactured in Denmark by Bruel & Kjaer). (See box opposite page). Thus Brush can offer you matched systems, and offer application assistance on complete projects.



MAGNETIC HEADS

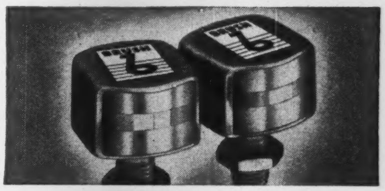
Brush offers single channel record-reproduce and erase heads, multichannel record-reproduce heads, miniature record-reproduce heads and erase heads.

Multichannel heads available in standard designs in encased assembly or cartridge assembly up to 26 channels. New high precision models offer extremely close tolerances.



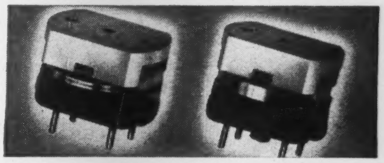
MULTICHANNEL HEAD DESIGN FEATURES

- **Balanced magnetic structure with gaps at front and rear.**
- **All gaps in precise alignment.**
- **Individual channels are cast into one integral block of specially selected synthetic resin.**
- **Complete assembly is non-microphonic and impervious to moisture.**
- **Mu-metal shields between individual channels.**
- **Ground lead supplied for shields and pole pieces.**
- **Wide range temperature operation.**
- **Special design features may be supplied to meet your requirements.**



SINGLE-CHANNEL REDHEADS

Halftrack	Fulltrack
BK-1090 Record/Reproduce	**BK-1250** Record
BK-1091 High Impedance	**BK-1251** Reproduce
BK-1110 Erase	**BK-1252** Erase



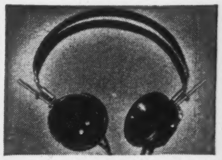
CARTRIDGE TYPES

The BK-900 series heads were designed for single-channel recording on any magnetic medium.

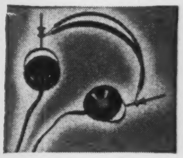
HEADPHONES

Brush crystal headphones have Bimorph® crystal drive element of high impedance, offer wide range response with uniform output, are lightweight, rugged, shockproof. Brush also offers a complete line of cartridges for acoustic applications.

BA-206 Headphone		**Model A**	General purpose headphones
Model A-1	High fidelity headphones	**Model A**	Single phone



Model "A". Designed for GENERAL PURPOSE applications including laboratory, studio and skilled amateur home use. High impedance; ideal for multiple installations.



Model BA-206. Designed for use where high fidelity and smooth frequency response are of paramount importance. Features exceptionally flat frequency response.

PIEZO-ELECTRIC ELEMENTS

for electro-acoustical and electro-mechanical applications: Plates of Rochelle Salt; Ammonium Dihydrogen Phosphate (ADP); Lithium Sulphate; Barium Titanate (Brush Ceramics A & B); Dipotassium Tartrate (DKT); Cylinders, curved plates, bowls and other shapes of Barium Titanate (Brush Ceramics A & B); Bimorphs* of Rochelle Salt; Ammonium Dihydrogen Phosphate (ADP); Barium Titanate.

ELECTRO-OPTIC ELEMENTS — Unpolished blanks of Ammonium Dihydrogen Phosphate (ADP); Potassium Dihydrogen Phosphate (KDP) for electro-optic shutters, etc.

For complete information write Dept. A

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Non Destructive and Physical Testing and Measuring Instruments for

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CARSON-DICE ELECTRONIC MICROMETERS

Direct measurement of thickness to .000020—not a comparator. Pressureless measurement—eliminates "feel" as a source of error. Applicable to hard or soft materials, conducting or nonconducting. Unaffected by temperature, vibration, leveling or aging of tubes. Hand operated and automatic motor driven models available.

CYCLOGRAPH

Automatic or manual high-speed sorting of metal parts by 10 metallurgic characteristics. Insures uniform quality, sorts up to 300 pieces per minute. Salvages mixed lots non-destructively, and is applicable to raw stock, semi-finished or finished parts—any size.

ULTRASONIC METROSCOPE

Measures wall thickness from one side only. Detects internal defects non-destructively in sheet, plate, and flat stock. Locates imperfect bond between clad metals.

MICROHM METER

Measures electrical resistances as low as 1 Microhm (.000001 ohms). Portable, 5 range instrument for field or shop use. 2% accuracy. Self-contained power supply. Measures contact resistance in large circuit breakers without disassembly. Quality control of small electrical assemblies and for inspection of incoming raw materials. Basic instrument for checking "cleanliness" of aluminum prior to spot welding.

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For more information circle 9 on inquiry card.

Geotechnical Corporation 194
Gertsch Products, Inc. 224
Giannini & Co., Inc., G. M. 62
Glass Instruments, Inc. 120
Gould Company, J. D. 236
Gow-Mac Instrument Co. 78
Graton & Knight Company 75
Gray Instrument Company 73, 164
Green Instrument Company 136
Green Instruments, Inc., Henry J. 68, 125, 125
Greiner Glassblowing Laboratory ..121
Grove Valve and Regulator Company 173
Guardian Electric Mfg. Co. 184
Gubelman Publishing Company 76
Gurley, W. & L. E. 154
Gustafson Mfg. Co., G. D. 163
Guthery Machine Tool Corp. 137

Hagan Corporation 49
Hammel-Dahl Company ....Inside Back Cover
Hankison Corporation 58
Hanson-Gorrill-Brian, Inc. 95, 227
Hart Manufacturing Company 184
Hass Brothers Instrument Co. ..69, 143
Haydon Company, A. W. 27
Hayward Scientific Glass Corporation 122
Heiland, Div. of Minneapolis-Honeywell Regulator Co. 28
Heise Bourdon Tube Company, Inc. 172
Helicoid Gage Division 41
Heller Co., Gerald K. 149
Herron Optical Co. 153
H & H Machine Company 230
Hickok Electrical Instrument Company 2

Illinois Testing Laboratories, Inc. .. 25
Indiana Steel Products Company ..141
Indicating Calipers Corp. 96
Induction Motors Corp. 43
Industrial Engineering Corporation 174, 234
Industrial Instruments, Inc. 23
Industrial Test Equipment Co. 159
Instrof Corp. 229
Instrument Gear Works 118
Instrument Laboratories 79
Interelectronics Corp. 165
International Optical Company, Inc. 155
International Rectifier Corporation 183

Jadow Inc., B. 222
Jaegers Optical Corp., A. 153
J-B-T Instruments, Inc. 248
Jerguson Gage & Valve Company ..133
Johnson Engineering Company Inc., Welton V. 162
Johnson Service Company 22
Johnson-Williams, Inc. 117
Jones Optical Works, A. D. 152
Joy Manufacturing Company 86

Karn Chemical Equipment Company 220
Kates Company, W. A. 108
Kearfott Company, Inc. 9
Keller, Jr., Hugo P. 129
Kessler Co., Frank 226
Kieley & Mueller, Inc. 29
King Engineering Corporation 144
Kirk and Blum Mfg. Co. 4
Kistler Instrument Company 174
Koehler Instrument Co., Inc. 159
Kollmorgen Optical Corporation 98

Landsverk Electrometer Co. 181
Lehigh Chemical Company 135
Lerco Electronics, Inc. 80
Levy & Company, Max 192
Lewis Engineering Co. ....Back Cover
Lewis Spring & Mfg. Company ..199
Lindberg Products Company 10
L & L Manufacturing Co. 115
Los Angeles Scientific Instrument Co. 163

Mack Electric Devices, Inc. 188
Magnatrol Valve Corp. 236
Magnetic Analysis Corp. 141
Magnetic Research Corp. 65
Magnetrol, Inc. 133
Manning, Maxwell & Moore, Inc. 12-13
Marsco Mfg. Co. 121
Marshalltown Manufacturing Co. ..173
Marx Co., Clarence J. 209
Mason-Neilan Division 52
Maymer Corporation 193
McDanel Refractory Porcelain Company 228
Measurements Corporation 48
Mereoid Corporation 213
Meriam Instrument Company ..113, 143
Metavac, Inc. 107
Mico Instrument Co. 136
Mid-Century Instrumatic Corp. 42
Milwaukee Gas Specialty Co. 186
Mine Safety Appliances Company .. 20
Moeller Instrument Company 36
Moore & Company, Samuel 40
Morehouse Machine Co. 215
Moseley Co., F. L. 247
Moser Jewel Company 130
Mueller Electric Co. 83
Murphy & Miller, Inc. 105

Nash Engineering Company 60
Nester Company, Inc., L. G. 120
Neutronic Associates 166
New England Laminates Co., Inc. ..127
New Hermes Engraving Machine Corp. 136
Newage International, Inc. 124
Niagara Blower Company 61
North American Van Lines, Inc. .. 45
Norwood Controls 21
Nurnberg Thermometer Co., Inc. ...219

Ohmart Corp. 180
Oil Well Water Locating Company ..152
Opad Electric Company 166
Owen Laboratories 72, 226

Pacific Optical Corporation 154
Pacific Universal Products Corporation 147
Palmer Thermometers, Inc. 38
Pancro Mirrors, Inc. 147
Panellit, Inc. 88
Parker Appliance Company 18-19
PCA Electronics Incorporated 225
Penn Optical & Instrument Co. ..138
Perkin Engineering Corporation .. 1
Permag Corp. 141
Peschel Electronics, Inc. 238
Petrometer Corporation 26
Phaostron Instrument & Electronic Co. 239
Phoenix Precision Instrument Co. .182
Photo Research Corp. 176
Photcon Research Products 170
Physics Research Laboratories 190, 238
Pollak Corproation, Joseph 185
Potter Aeronautical Company 111
Power Designs Inc. 239
Powers Regulator Company 5
Precise Measurements Company 50
Precision Glass Products Co. 121
Precision Products Company Inc of Waltham 201
Preis Engraving Machine Co., H. P. 136
Premier Metal Products Co. 179
Propulsion Development Laboratories 213
P-W Industries, Inc. 230
Pyrometer Instrument Co. 177

Racine & Company, Inc., Jules 221
Radio Frequency Laboratories, Inc. 101, 140, 211
Rahm Instruments Inc. 35
Ramapo Instrument Company, Inc. 215
Rapid Specialties Company 145
Red Point Corporation 102
Renick Co., L. C. 192
Republic Flow Meters Co. 70, 100, 112, 132, 175, 234
Republic Manufacturing Co. 235
Research Appliance Company 59
RHO Engineering Company 279
Richards Co., Inc., Arklay S. 280
RKL Valve & Manufacturing Co. ..235
Robbins Aviation 125
Robinson Orifice Fitting Company 158
Rodon, Inc. 73
Rogan Brothers 130

Sanborn Company 33
Sandvik Steel, Inc. 201
Scherr Co., Inc., Geo. 96
Security Valve Corp. 232
Seegers Manufacturing Co. 170
Servonic Instruments, Inc. 164
Servospeed Div. of Electro Devices, Inc. 23
Shore Instrument & Mfg. Co., Inc. 124
Shurite Meters 64
Sibley Co. 79
Simpson Optical Manufacturing Company 153
Sola Electric Co. 223
Southern Electronics Corporation ... 3
Spellman Television Co., Inc. 67
Sprague Engineering Corporation ..173
Sprengnether Instrument Co., Inc., W. F. 194
Standard Cabinet Company 104
Standard Electric Time Co. 221
States Company 160
Statham Development Corporation ..106
Stevens-Arnold Incorporated 91
Stewart Corp., F. W. 195
Sticht Co., Inc., Herman H. 101, 114, 199
Sturtevant Co., P. A. 246
Stylograph Corporation 78
Swartwout Company 24
Swiss American Jewel Bearings Co. 129, 178, 193, 205, 217

Taylor Pivot Company 285
Technical Apparatus Builders 15
Technical Associates 179
Technical Charts Incorporated 77
Technical Electronics Corp. 150
Technique Associates, Inc. 178
Tenney Engineering, Inc. 31
Tensitron, Inc. 285
Testa Mfg. Co. 152
Testing Machines, Inc. 97
Texas Instruments Incorporated 35, 63, 226

Continued on page 10

PRECISION SYSTEMS AND COMPONENTS *in production*

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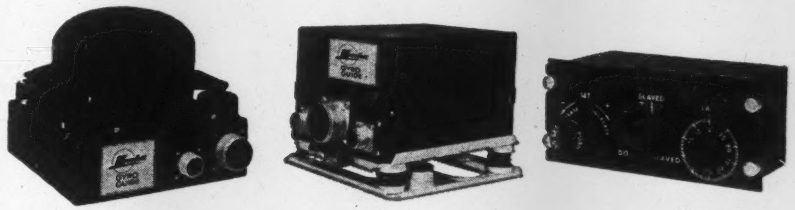
Kearfott Systems include 3 gyro, 3 and 4 gimbal platforms. They provide precise azimuth and vertical reference. Also Directional Gyro Compass Systems.



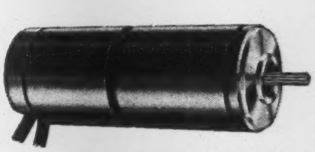
The Gyro Guide System shown provides Latitude Corrected Gyro and Magnetic Slaved Heading information. Weighs 20 lbs. Max. random drift 3°/hour.

GYROS, SERVO MOTORS, SYNCHROS

Kearfott produces a complete line of gyros, servo motors, and synchros to satisfy every aircraft control requirement.

FLOATED INTEGRATING GYRO

3 Gyro Platforms, Floated Rate Integrating Gyros, Vertical, Free, Directional, Rate Gyros and Gyro operated rate switches—compact, lightweight, hermetically sealed.



SERVO MOTORS, SYNCHROS

High torque, low inertia Servo motors, Servo-motor-Generators, inertial and viscous damped Servo motors 3/4" to 1-3/4" diameter, Synchro Transmitters, Control Transformers, Resolvers, Repeaters and Differentials in size 8, 11 and 15.

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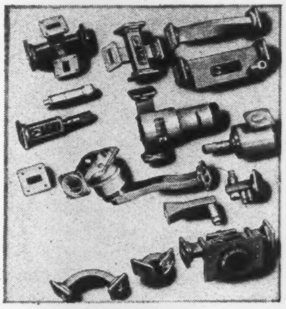
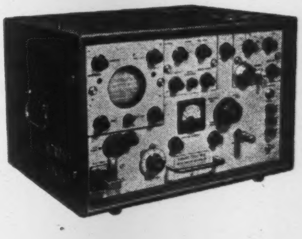
Kearfott offers engineering-design service, manufacturing facilities and a wide experience in the production of microwave components and test sets.



COMPONENTS

Including attenuators, directional couplers, crystal mixers, twists and tees for S, C, Xb, X and Ku bands.



TEST SETS (for X, C, and Ku)

A four-in-one instrument for functional testing of radar or beacon. Includes Wavemeter, Spectrum Analyzer, Power Monitor, and signal generator.

Bulletins giving physical and technical data on the various Kearfott Products will be sent on request. The Kearfott organization is available to assist in the development and manufacture of other precision components you may require.

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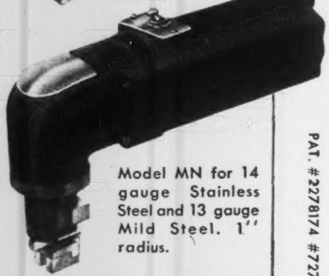

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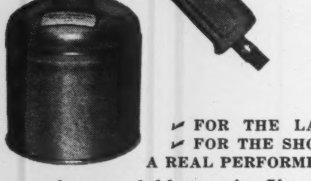
Operates on 60 to 150 P.S.I. Handles all types of abrasives.



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For more information circle **12** on inquiry card.

Thermco Laboratories 117
Thermo Electric Co., Inc. 178, 193, 205, 217
Thermo-Products Co., Inc. 216
Tigerman Engineering Company ...148
Tinker & Rasor 156
Tinsley Laboratories 155
Trimount Instrument Co. 143

Uehling Instrument Company 296
Ulanet Company, George 219
Unertl Optical Co., John 152
Ungar Electric Tools, Inc. 197
United Instrument Co. 218
U. S. Electronics Development Corp. 74
United States Gauge, Div. of American Machine & Metals, Inc. .171
U. S. Gear Corporation 119
Universal Atomics Corporation 168
Universal Electronics Co. 167
Universal General Corp. 184

Valcor Engineering Corporation 32
Vari-L Company, Inc. 126

Vectron, Inc. 147
Veeder-Root Inc. 44
Vitramon Incorporated 74

Wabash Metal Products Co. 139
Walkirt Co. 90
Wallace & Tiernan Incorporated ..142
Warrick Co., Charles F. 133
Waterman Products Co., Inc. 11
Waugh Engineering Company 109
Waxon-Carboff, Inc. 77
Weiss & Son, Inc., Albert A. ... 218
Weksler Thermometer Corporation . 219
Westronics Incorporated 163
Wiancko Engineering Company ... 210
Wolfe & Mann Mfg. Co. 158
Worley Jewel Co., John 130

Zeiss, Inc., Carl 146
Zenith Optical Laboratory 155
Zernickow Co., O. 209

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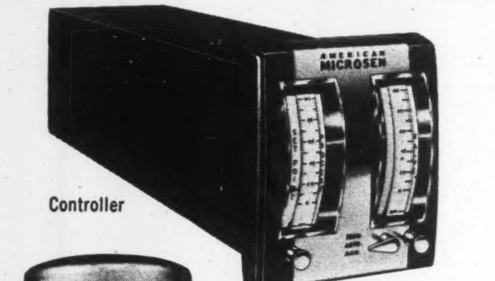
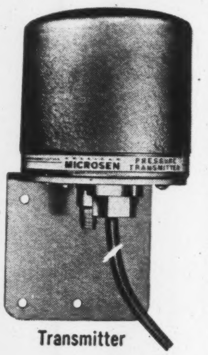
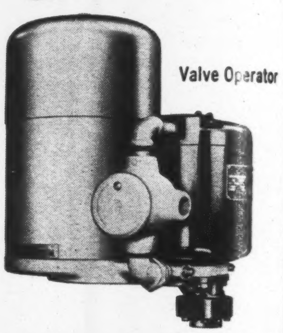


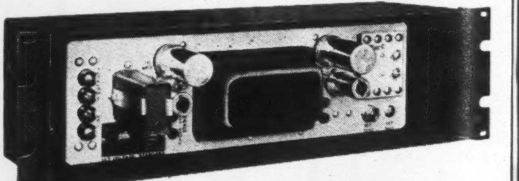
Controller



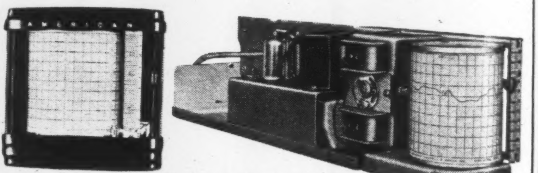
Transmitter



Valve Operator



Transmitting Potentiometer



Microammeter Recorder

'American-Microsen' Precision Electronic Relays are available for alarm signalling and on-off operation of electrical loads, for actuation by 'American-Microsen' transmission or control system signals.

Our ***INDUSTRIAL CONTROLS DIVISION*** *manufactures 'American-Microsen' Electronic Instruments for measurement, transmission and control of process variables. All are precision devices built to the highest specifications of durability. All incorporate design and engineering characteristics that assure maximum performance and freedom from costly maintenance regardless of the requirements of the most demanding applications.*

'AMERICAN-MICROSEN' TRANSISTORIZED ELECTRONIC PROCESS CONTROL SYSTEM. Designed to measure, indicate, record and control pressure, differential pressure, temperature, liquid level, flow, pH, oxygen concentration, gas analysis, etc. Basic units in the complete system are: **1) Transmitter** that accurately measures the variable and transmits the information to the controller on the panel board; **2) Controller** that handles *all* control functions — indicating or recording the process variable, controlling, and manual-automatic operation; **3) Electro-Hydraulic Control Valve Operator** — a power unit with position feedback to operate slip-stem valves, dampers, etc. (The 'American-Microsen' Electro-Pneumatic Valve Positioner is also available, if required.)

Transistors and printed circuitry are used to save space and to improve reliability and service life. The system attains such high reliability, lag-free transmission, sensitivity and accuracy that an entirely new concept of these control factors is created. The effects of distance in transmission are completely eliminated: the use of the famous "Microsen" balance assures a stable dc signal. No compressed air is required.

The 'American-Microsen' Process Control System can be integrated with electric digital print-out equipment to provide automatic logging or multipoint-potentiometer type recording.

'AMERICAN-MICROSEN' TRANSMITTING POTENTIOMETER. An extremely sensitive instrument. Makes it possible to measure and control accurately thermocouple temperatures or the signals from pH amplifiers, gas analyzers, resistance thermometer elements and other electrical systems. Provides continuous highest accuracy without drift. Responds to input change of 3 microvolts or less. Response speed: 0.04 second time-constant for 1000° F. span. No slide wires or choppers—trouble-free operation. The signal output transmittable 30 miles or more, over a simple two-wire circuit. In addition to application with 'American-Microsen' receivers, the signal will operate standard dc milliammeters and recorders.

'AMERICAN-MICROSEN' MICROAMMETER MILLIVOLTMETER RECORDER. Accurately measures low-level dc signals with calibration accuracy within 0.5%, and sensitivity within 0.2% of span. Records on 3″ continuous strip chart or IBM-type card chart, with linear coordinates. Speed: up to 0.05 seconds for 63% of full scale changes. Positions recording pen with force thousands of times greater than the usual direct deflection electrical movements. "Microsen" balance compensates for ambient conditions, changes in power supply and components. Span and zero adjustments assure easy calibration and zero suppression *in the field*, without special equipment. Power is ample to operate alarm contacts.

For more information circle **14** on inquiry card.

WHERE
the products of
MANNING,
MAXWELL
& MOORE, INC.
are manufactured

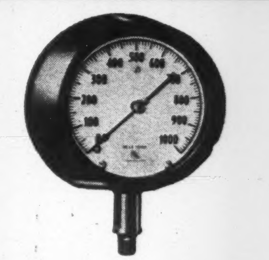
INDUSTRIAL CONTROLS DIVISION: **'American-Microsen' Industrial Electronic Instruments, *Stratford, Conn.***

CONSOLIDATED ASHCROFT HANCOCK DIVISION: **'American' Industrial Instruments, 'Ashcroft' Gauges, 'Consolidated' Safety and Relief Valves, *Stratford, Conn.* 'Hancock' Valves, *Watertown, Mass.* 'Consolidated' Safety Relief Valves, *Tulsa, Okla.***

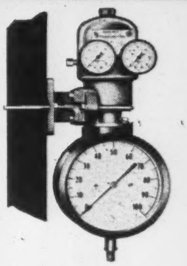
AIRCRAFT PRODUCTS DIVISION: **Aircraft and General Application Products for Pressure and Temperature Measurement and Control, *Danbury & Stratford, Conn. and Inglewood, Calif.***

Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario, manufactures 'Ashcroft' Gauges, 'Consolidated' Safety and Relief Valves and 'Hancock' Valves. Abroad, well-known companies in England, France, Belgium, Western Germany and Italy are licensed to manufacture many of our products. We will gladly supply their names upon request.

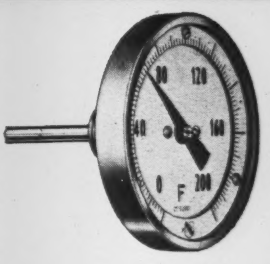
Our **CONSOLIDATED ASHCROFT HANCOCK DIVISION** *produces a great variety of precision pressure gauges, industrial thermometers, temperature regulators and valves for every industry. All are skillfully manufactured products long recognized throughout the world for technical excellence, complete reliability, economy, and long life under the most adverse conditions of use.*



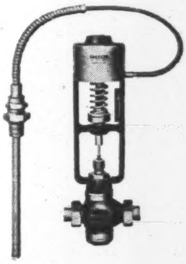
'Ashcroft' Pressure Gauges. Accurately indicate or record pressure of steam, air, water, oil, gas and other media – 30" vacuum or a few ounces up to 100,000 psi. Eight Bourdon tube materials available. Cases made of Alumalife®, cast iron and phenol meet the widest range of services. Numerous dial sizes. Choice of all-stainless-steel movement or stainless-steel movement with nylon bearings and pinion gear.



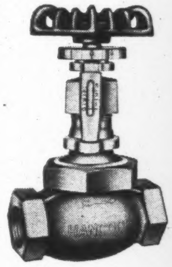
'Ashcroft' Pneumatic Pressure Transmitters. Combine speed with maximum protection and serviceability. Supply air pressure as low as 18-20 psi for 3 to 15 psi output provides especially advantageous operation where electrical wiring might be a hazard. Safely measure pressures up to 100,000 psi. Available with pressure sensing elements in all standard pressure ranges and Bourdon tube materials.



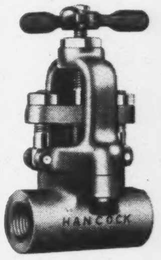
'American' Thermometers. Industrial glass, dial, and recording types. Mercury, vapor pressure, gas or bi-metal actuation. All types are accurate, easy to read, ruggedly built. *Temperature ranges:* minus 100° F. to plus 3000° F. depending upon type. Mercury-actuated instruments with "Magic Pulse" self-compensating capillary tubing permit reading temperatures far from their source.



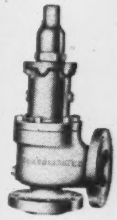
'American' Temperature Regulators. Self-operated, precision type. Eliminate costly, erratic manual control. Provide positive temperature control of oil, water, steam and other media in heating or cooling processes. No electricity or compressed air needed. Save fuel and manpower, assure greater product uniformity. Temperature adjustment and repeat setting are easy. *Sizes:* ¼" to 4".



'Hancock' "Flocontrol" Valves. For manual control of flow, temperatures, pressure. 3-in-1 design provides index, proportional flow and shut-off. Micrometer dial and pointer permit settings within 1/100th turn of the handwheel. Any setting easily duplicated. Globe and angle types. *Bronze:* ¼" thru 2"–150# and 300# series. *Steel:* ¼" thru 4"–150#, 300# and 600# series flanges.



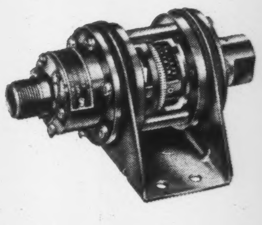
'Hancock' Instrument Valves. High pressure, stainless steel valves for use on instrument panels, on instrument, gauge, bypass and corrosive lines, and on orifice meters. Ideal for services where high temperatures are of short duration and occur infrequently. Compact–permit close alignment of piping with near structures. Globe and angle types. Stem and disc are of needle point design. *Service rating:* 6000# O.W.G. – 100° F. *Sizes:* ¼", ⅜" and ½".



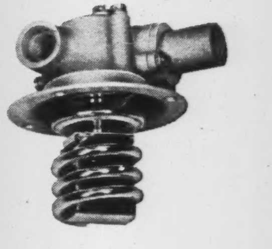
'Consolidated' Safety Relief Valves. Protect unfired pressure vessels – gas, vapor and liquid storage tanks, pipelines, pumps – against overpressures. Safeguard personnel, plant and equipment. Valve action is consistently positive. '2 in 1' design permits the Standard type to be converted to Bellows type *in the field.* Can also be interchanged with safety relief valves of other makes. Have fewer functional parts than comparable valves – maintenance is easier, more economical.

Our **AIRCRAFT PRODUCTS DIVISION** *manufactures many products for pressure and temperature measurement and control. These include electronic, pneumatic and hydraulic devices. Among them are aircraft fuel valves, pressure gauges and switches, temperature controls, servo and hydraulic valves. All are built to the highest specifications of precision and durability to assure superb performance under the severest conditions.*

"Vapoflash" High Temperature Measuring Probe. Mercury actuated. Size is comparable to that of a thermocouple. Operating range: 900° F. to 1500° F. High gain pneumatic output signal provides adequate power for gas turbine control actuation. Permits application of simplified mechanisms to modulate main engine and afterburner fuel flow and the exhaust area of turbojet engines. Several "Vapoflash" units, connected in parallel, simplify averaging, measurement and control of gas turbine temperatures.



Pressure Actuated Switch Type 6885. For use in aircraft, rocket, and guided missiles to control electrical circuits. Accurate over wide temperature range. Immune to standard aircraft fuels and corrosive media. Operating range: 0-10, 10-50, and 50-100psi. Ambient temperature: minus 65° F. to plus 250° F. Vibration: up to 2000cps at 20g. *Size:* 4⅜" L. x 2-3/16" H. x 3⅝" D. *Weight:* 9 oz.



Ram Temperature Sensor-Transmitter Type 155F6. For jet engines designed for supersonic flight. Provides large motive power for resetting governors and other control members. Uses fuel, air or other medium to supply control pressure accurately proportioned to ram intake temperatures ranging from minus 100° F. to plus 650° F. Time response: 1.5 seconds for air flow at 35 lbs./sq. ft./sec.

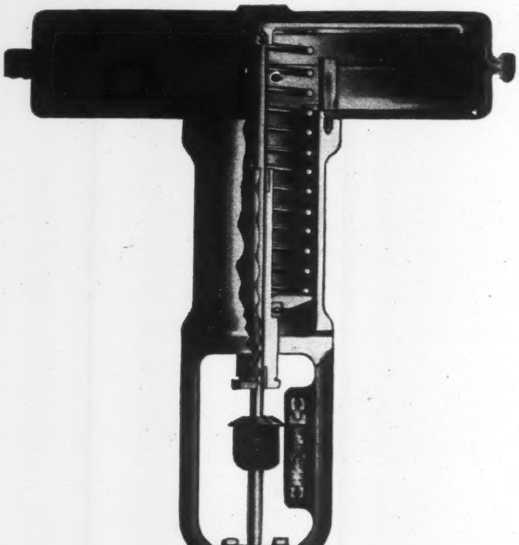
MANNING, MAXWELL & MOORE, INC.

STRATFORD, CONNECTICUT

MAXWELL
MANNING
& MOORE
OF CANADA, LTD.

NOW! AN ALL-NEW LINE Of Diaphragm Control Valves!

...It's The New BS&B Super "70" Series.



- ✓ **Entirely New Topworks— Linear, Accurate Response!**
- ✓ **Redesigned Valve Body— Even Greater Stability!**
- ✓ **All-Metal Float Ring Seal*— Self-Actuating Closure!**

NEW *Topworks*

- Choice of two styles ... direct or reverse acting. Four sizes.
- New moulded diaphragm gives uniform thrust over full valve travel.
- Pressed steel cases for maximum strength with minimum weight.
- Single spring, precision calibrated.
- Iridited and cadmium plated for corrosion resistance.
- Recessed spring in reverse-type topworks.

NEW *Valve Bodies*

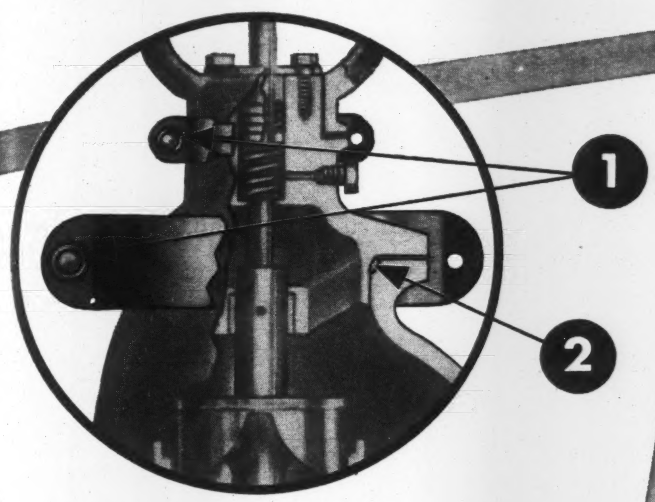
- Choice of three styles ... single port, double port and split body for use in erosive or corrosive fluid service where easy removability of valve seat is desirable.
- New streamlined flow contours provide greater stability.
- New inner valves give more exacting flow characteristics ... Four types ... Top and bottom guided.
- New all-metal float ring seal provides self-actuating closure ... tightens with application of pressure.
- New forged clamp ring allows yoke orientation to any position ... requires only two bolts ... quick dis-assembly.
- Bolted stuffing box with stainless steel follower.
- Retains split and bolted stem connector, innovated by BS&B.
- All dimensions for steel bodied valves are in accordance with ASA Standards B16.5—1953.

*Patented

For complete information on the all-new BS&B Super "70" Series of Diaphragm Control Valves, ask your BS&B Man—or write to...

BLACK, SIVALLS & BRYSON, INC.

Controls Division, Dept. 4-BV57
7500 East 12th Street • Kansas City 26, Missouri



Exclusive New BS&B Features Include...

❶ Newly Designed Clamp Ring

...Is used to seal top and bottom plates to valve body, and to integrate body and topworks assemblies into a single unit!

...Allows yoke orientation to any convenient operating position for observation and action!

...Requires only two bolts, avoiding use of multiple bolts and studs. Allows quick dis-assembly!

❷ New All-Metal Float Ring Seal

...Employs a new design principle to provide an absolutely leak-proof positive closure!

...Tightens automatically as pressure increases within the valve. The higher the pressure — the tighter the seal!

...Automatically adjusts with changes in temperature!

...Eliminates the annoyance of gasket replacements!

OVER 60 YEARS
BS&B
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

For more information circle **15** on inquiry card.

"TABTRON"

HIGH CURRENT POWER SUPPLIES

Variable 0-28VDC. Completely Built. Ready to Go. Full Wave Selenium Rectifier, Transformer, Variac, 4" Volt & Amp Meters, Switch, Terminals & Fuse. In Heavy Duty Steel Cabinet. Std 115 Volt 60 Cy. In OR 220V† (3 phase) to order.

Stock No.	Cont. Rating	W/Meters
T28V5A*	0-28VDC at 5 Amp	$ 50.00
T28V5ACC	5 AMP 1% Ripple	85.00
T28V5A2CC	5 Amp 0.01% Ripple	145.00
T28V12A	0-28VDC at 12 Amp	125.00
T28V12ACC	12 Amp 1% Ripple	160.00
T28V24A†	0-28VDC at 24 Amp	220.00
T28V24ACC†	24 Amp 1% Ripple	155.00
T28V50A†	0-28VDC at 50 Amp ...	225.00

*2" Meters; all others 4" Meters

VARIABLE DC LINE SUPPLIES

Variable 75-135VDC. Completely Built. Ready to Go. Includes F. W. Selenium Bridge Rectifier, Filter, 4" Rectangular Volt & Ammeter, Overload cut out & components as in other supplies. Designed for cont. service. SPECIFY for 115 OR 230 VAC/60 Cycle/1 phase.

T120V5AC	75-135VDC at 5 Amp	$190.00
T120V4ACC	4 Amp 1% Ripple	240.00
T120V10AC	75-135VDC at 10 Amp ..	245.00
T120V8ACC	8 Amp 1% Ripple	295.00

NEW! LO PRICED BASIC SUPPLIES

DC Power Supplies consisting of Transformer & Full Wave Bridge Selenium Rectifier. Mtd Wired. Std. 115V In OR 230 VAC† to order, SPECIFY. Hvy Steel Cabinet. **Less Meters.**

B12V10A	12VDC at 10 Amp	$39.00
B12V24A	12VDC at 24 Amp	87.00
B28V5A	28VDC at 5 Amp	39.00
B28V12A	28VDC at 12 Amp	83.00
B115P5A	115VDC at 5 Amp	98.00

C "TAB" FOR FAST DELIVERY SPECIALS

NEW "TABTRON" SELENIUM RECTIFIERS

ENGINEERED *for* AUTOMATION & INDUSTRY

"Technical Apparatus Builders" mfgrs. power rectifiers to your specs. From one amp up to and above 1000 amps, convection or fan cooled, single or 3 phase. "NEMA" & JAN. Specs.

***FULL WAVE BRIDGE • DATED & ONE YEAR GTD**

							Ctr Tap	3 Phase Bridge	
Max Amp	18VAC* 14VDC	36VAC* 28VDC	54VAC* 42VDC	72VAC* 56VDC	130VAC* 100VDC	266VAC* 217VDC	AC/DC 30/12	120VAC 150VDC	240VAC 300VDC
1	$1.40	$2.80	$3.70	$4.45	$7.40	$25.00	$2.40	$17.10	$35.25
2	2.00	3.40	5.30	5.85	10.25	29.00	2.70	18.25	45.00
3	2.90	4.10	5.75	7.80	12.70	37.00	3.05	20.00	49.50
4	3.50	6.40	11.25	14.30	25.00	45.00	3.40	21.70	55.75
6	3.95	7.70	12.75	17.25	29.65	59.00	3.70	24.00	59.90
10	5.85	11.35	19.40	24.75	41.25	85.00	5.45	42.40	91.25
12	7.20	14.25	22.00	29.50	43.85	100.00	6.80	48.15	113.50
20	13.00	25.00	37.00	48.00	78.00	161.00	9.15	58.50	164.75
24	15.00	28.50	44.25	57.50	80.65	191.00	11.45	103.35	241.00
30	17.85	34.25	56.25	70.50	108.00	236.00	14.90	135.55	289.00
36	22.35	42.00	64.75	86.50	133.65	296.00	17.20	155.10	368.00
50	29.40	54.00	105.00	115.00	173.00	405.00	27.50	206.85	496.00
100	59.00	118.00	218.00	242.00	325.00	796.00	Q	374.00	888.00
200	132.00	242.00	425.00	472.00	773.00	Q	Q	734.00	Q

Write for Our Brand NEW Power Supply & Rectifier CATALOG PR156-B

NEW "TABTRAN" RECTIFIER CHOKES

CR6001	1 AMP/0.1	HY/1.4 OHM ...	$ 3.95
CR6002	2 AMP/0.1	HY/.67 OHM....	5.95
CR6003	5 AMP/.07	HY/.6 OHM.....	7.95
CR6004	12 AMP/.01	HY/.1 OHM.....	14.95
CR6005	24 AMP/.001	HY/.025 OHM...	29.95

NEW "TABTRAN" RECTIFIER XFMRS

Sec (Dual†) 0-9-15-18 & 0-9-15-18 v. Series Sec 0-3-6-9-12-15-18-21-24-27-30-33-36 volts

TR5007	1 Amp	†	........@$ 5.25
TR5008	2 Amp	†	........@ 6.35
TR5001	5 Amp	†	........@ 8.65
TR5002	12 Amp	†	........@ 16.65
TR5003	24 Amp	†*	..................@$ 35.65
TR5004	50 Amp	†*	..................@ 59.95
TR5005	100 Amp	†*	..................@ 108.65

† Wndgs in Series at ratings shown; Parallel 2x Current, Voltage 0-9-15-18.
* Dual Primary 115/220V 60 Cycle
ALL PRICES SHOWN SUBJECT TO CHANGE

TECHNICAL APPARATUS BUILDERS
109-A LIBERTY ST., NEW YORK 6, N.Y.
CABLE "TABPARTS" PHONE RECTOR 2-6245

For more information circle **16** on inquiry card.

QUICK CHECK LIST *of*

If your operation can benefit from more accurate measurement or control of any of the process variables listed below, Foxboro Instrumentation offers the most advanced equipment to supply it. This complete line of individual instruments and fully integrated systems is the product of years of engineering experience in every phase of industrial processing. It's your assurance of maximum performance and freedom from maintenance. Complete details on any instrument or system shown here will be sent promptly on request. In addition, Foxboro Field Engineers will gladly assist you in solving individual control problems. For complete details, write **The Foxboro Company, 4613 Neponset Ave., Foxboro, Mass.**

Indicators · Recorders · Controllers

air weight
btu
capacitance
compression
concentration, solution
conductivity, solution
consistency
current—a-c, d-c
density
dew point
displacement
drag
flow
force
gas analysis
humidity
liquid analysis
liquid level
load
moisture content
motion
motor load
operation, schedule
operation, time
oxidation-reduction potential
pH
position
power, electric
pressure
resistance, electric
sheet moisture
sheet weight
specific gravity
speed
strain
stress
temperature
tension
thrust
torque
vacuum
viscosity
voltage
weight

Controller Actions

Pneumatic or Electric

On-Off
Proportional
Proportional with Derivative
Proportional with Reset ("Stabilog")
Proportional with Reset and Derivative ("Hyper-Reset")
2- and 3-position
Multi-Position

Instruments by FOXBORO

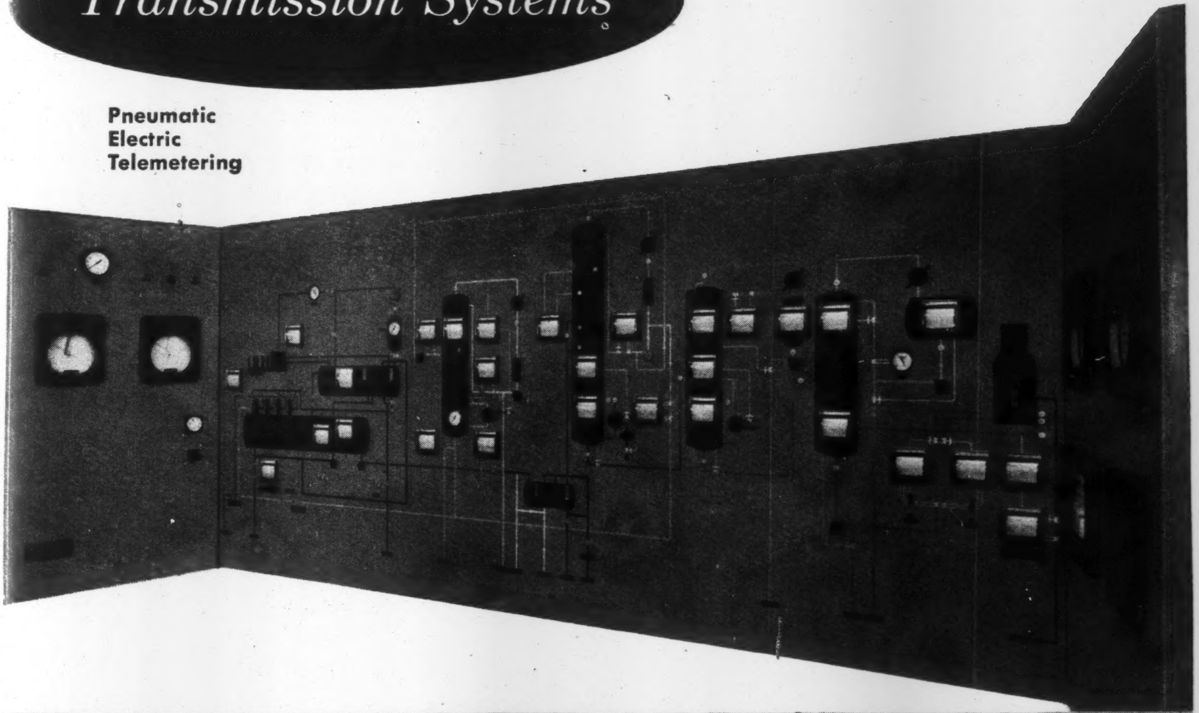
REG. U. S. PAT. OFF.

Special-Purpose Controller Types

- **Auto-Selector**
- **Averaging**
- **Dual**
- **Duplex**
- **Limit**
- **Multi-Zone**
- **Ratio**
- **Relation**
- **Sequence**
- **Time Schedule**
  - **(cam and camless types)**
- **Triple**

Transmission Systems

- **Pneumatic**
- **Electric**
- **Telemetering**



Cabinet and Panel Assemblies

Any combination of Foxboro Instruments required for precise control of an industrial process is available in a complete pre-engineered cabinet, console, or graphic panel assembly. All instrumentation is expertly connected and integrated at the factory. Installation requires only simple external connections of air and power supply, measurement or transmission lines.

THE FOXBORO COMPANY, 4613 Neponset Ave., Foxboro, Mass., U. S. A.

For more information circle **17** on inquiry card.

Parker
Hydraulic and fluid
system components

TUBE AND HOSE FITTINGS DIVISION
The Parker Appliance Company
Section 421
17325 Euclid Avenue • Cleveland 12, Ohio

WHY PARKER COMPONENTS HELP ASSURE EFFECTIVE INSTRUMENTATION TUBING SYSTEMS

PARKER INTRU-LOK TUBE FITTINGS

Designed especially for instrumentation lines. Flareless type. Simply push in tube, then tighten. Installation is that simple. Available for copper, aluminum or plastic tubing. Tests prove its superiority in withstanding vibration. Underwriters' Laboratories approval for hazardous liquids.

Sizes: for tube sizes 4 through 16 (tube O.D.s ¼ through 1").

Shapes: union, bulkhead, elbow, tee, cross, reducer, male pipe threaded 45° elbow, and male and female pipe threaded connectors, elbows and tees.

Materials: brass, aluminum (available in other materials on special order).

Reference: Intru-lok Fittings Catalog 4324.

For more information circle **18** on inquiry card.

Parker
Hydraulic and fluid
system components

TUBE AND HOSE FITTINGS DIVISION

The Parker Appliance Company
Section 421
17325 Euclid Avenue • Cleveland 12, Ohio

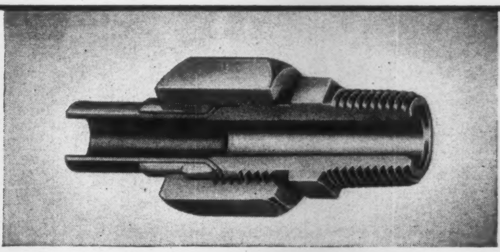
WELD-LOK TUBE FITTINGS, for extreme temperatures, corrosion conditions. Machined from high-quality bar stock and forgings. Tapered socket aligns and holds tube for welding operation. Correctly induced weld is unaffected by vibration, shock or thermal distortion.

Sizes: for tube sizes 4 through 16 (tube O.D.s ¼ through 1").

Shapes: Union elbow, 45° elbow, tee, cross, adapter, male pipe threaded connector, and female pipe threaded gage connectors.

Materials: steel, stainless steel.

Reference: Weld-lok Fittings Catalog 4370.



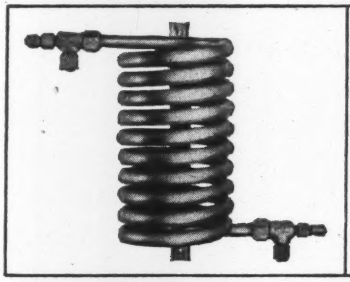
TRIPLE-LOK TUBE FITTINGS, flare type, for high-pressure, high-temperature, severe vibration service. May be reassembled repeatedly, always for leak-proof joint. Accommodates full range of standard tube wall thicknesses. ASME Code for pressure piping; Underwriters' Laboratories approval.

Sizes: for tube sizes 2 through 32 (tube O.D.s ⅛ through 2").

Shapes: unions, elbow, tee, cross, bulkheads, reducer, cap, plug, male pipe threaded 45° elbow and long elbows, and male and female pipe threaded connectors, elbows and tees.

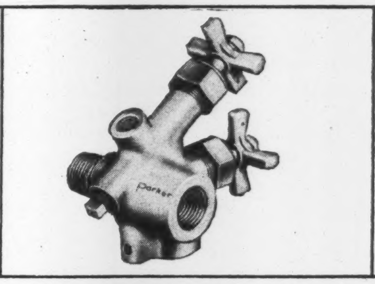
Materials: brass, steel, stainless steel, aluminum alloy.

Reference: Triple-lok Fittings Catalog.



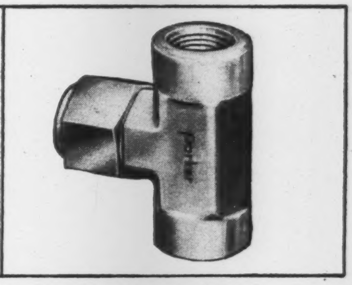
DUAL HEAT TRANSFER COIL

For cooling steam for water test samples on boilers of all ratings . . . Also for heat transfer on refrigeration equipment, oil stills, hydraulic circuits—Coil No. 3101-5 (copper): up to 1000 p.s.i., 700° F. Brass fittings. Coil No. 3101-6 (stainless steel inner coil) and Coil No. 3101-7 (Inconel inner coil) up to 2000 p.s.i., 1400°F. Outer coil copper. Coil terminal fittings steel. End fittings stainless steel. Coils for higher pressures and temperatures available on special order.



DRAFT GAGE MANIFOLD VALVE

Provides easy, efficient method for cleaning fly ash and combustion residue out of draft gage lines without disconnecting lines. Adaptable for multipointer gage installations.
Specifications: Brass. Compressed air side port — ½" MPT. Opposite side port — ½" FPT. Gage line connecting port (top) ⅛" FPT. Draft line connecting port (bottom) ⅜" FPT. Mounting hole — ¼"-20 tap (Class 2).



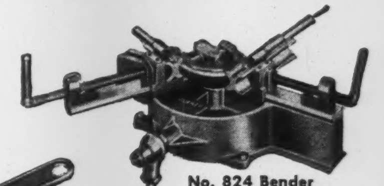
PRESSURE GAGE SNUBBER

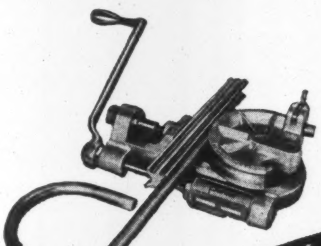
Pressure gage snubber prevents damage from violent pressure changes. Snubbing chamber is mounted on side for easy adjustment without disturbing line connections. Three different size pins offer 13 gradations of damping adjustment.
Specifications: Working pressure up to 5,000 p.s.i. Both connecting ports ¼" FPT. Body: high-strength forging. Pins: type 316 stainless steel.
Materials: brass, stainless steel.

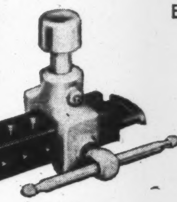
PARKER TUBE-WORKING TOOLS

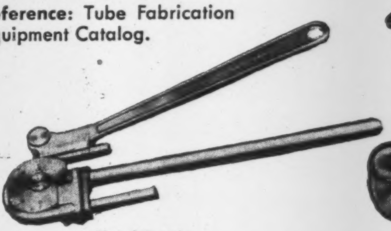
Dependable equipment for fabrication of all metal tubing including stainless steel. Hand tube benders, cutters, flarers; bench-mounted benders; power flarer-beaders.

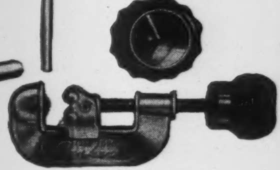
Reference: Tube Fabrication Equipment Catalog.


No. 824 Bender


Exactol Bender


No. 410 Flarer


Hand Bender


Tube Cutter

For more information circle **18** on inquiry card.

Announcing

the M-S-A SOUNDSCOPE

Soundscope

A precision instrument that combines the functions of

- **SOUND LEVEL METER**
- **OCTAVE BAND ANALYZER**
- **NARROW BAND ANALYZER**

in a single compact unit, with self-contained power supply and integral electrical and acoustical calibration

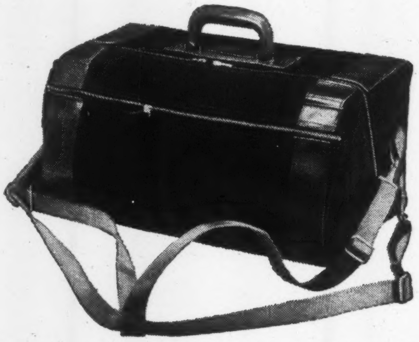
Safety engineers and industrial hygienists faced with the task of measuring and analyzing noise conditions are quickly recognizing the contributions of the M-S-A Soundscope. With this *single instrument* they can plot the answers to (1) overall sound pressure levels, (2) sound pressure levels of components in octave bands throughout the audible spectrum, and (3) sound pressure levels in bands narrower than whole octaves.

This unit, based on a design developed for Mine Safety Appliances Company by Allison Laboratories, Puente, California, meets pertinent specifications of the American Standards Association for Sound Level Meters and Analyzers.

The overall Sound Level Section covers the range of 24 to 150 decibels. Overall attenuation can be varied through a range of 110 db. in 10 db. steps. The Analyzer Section, controlled by coupled knobs, measures sound levels in each of the seven octave bands from 75 to 9600 cycles. Analyzer attenuation can be varied through the range of 40 db. in 10 db. steps. The Narrow Band Analyzer function utilizes a set of continuously variable high and low cutoff filters. Knob control provides settings of constant percentage band widths for fine analysis.

The compactness and extreme portability of the M-S-A Soundscope make it ideal for applications requiring many readings at different locations, as in the plotting of noise-level contour maps.

Our new bulletin gives complete information. Write for a copy.



Fabric luggage cover with shoulder straps provides protection . . . facilitates carrying.

MSA
SAFETY EQUIPMENT HEADQUARTERS

Call the M-S-A man on your every safety problem . . . his job is to help you

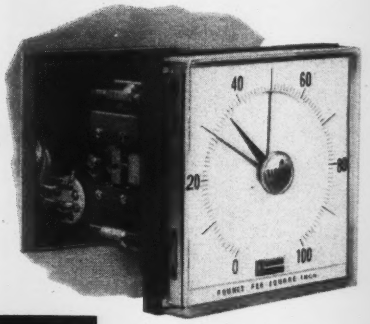
MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 76 Branch Offices in the United States

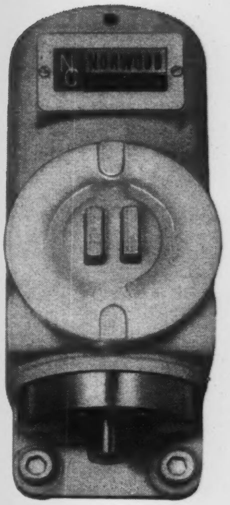
MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.
Representatives in Principal Cities in Mexico, Central and South America
Cable Address: "MINSAF" Pittsburgh

For more information circle **19** on inquiry card.

For process control . . .

ELECTROSYN SYSTEM





Electro-magnetic system designed to measure, indicate, record (including analog to digital conversions), or control wide range of critical process variables: pressure, differential pressure, flow, liquid level, temperature. Basic system comprised of signal transmitter, servo amplifier (magnetic) and Null Balance Indicator. Extreme reliability, flexibility of application and rugged construction for minimum maintenance characterize the NORWOOD CONTROLS ElectroSyn System.

HIGHer reliability— LOWer maintenance

NC NORWOOD CONTROLS

NORWOOD CONTROLS
UNIT OF DETROIT CONTROLS CORPORATION
934 Washington Street • Norwood, Mass.

Complete technical information available upon request.

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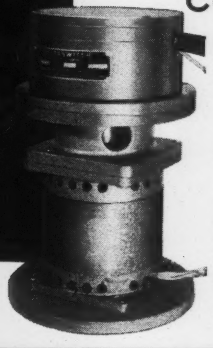
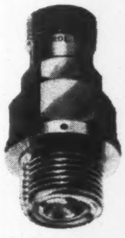
For high-speed commutating . . .

Deltaswitch

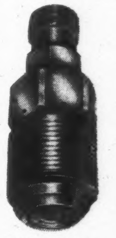


Unique multi-position rotary switch for commutating, sampling or chopping where application demands high speed (as many as 10,000 samples per second), long life and low noise. Deltaswitch utilizes a rotating jet of mercury to connect sequentially each of many stationary contacts through a low-resistance path to a common pole — no brushes or slip rings.

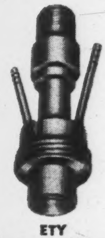
For precision testing and evaluation . . .



EPI Engine Pressure Pickup
Highly accurate, versatile transducer for dynamic pressure measurements requiring high frequency response. Ranges from 0-100 up to 15,000 psi.



EPQ Engine Pressure Pickup
For high pressure applications in engine analyses, gun barrel pressures, hydraulic high pressures, etc. Ranges up to 60,000 psi.



ETY Pressure Pickup
Water-cooled, high frequency transducer for pressure studies under very high temperatures. Can be exposed to gas temperatures above 5000°F without damage.

High Temperature Adapter
For use with Norwood Controls EP Transducers where temperature of the pressure medium is between 250°F and 600°F. Suitable for pressures up to 10,000 psi.

5 AC Pressure Monitor
Combination amplifier and calibrator for use with pressure pickups.

For more information circle **20** on inquiry card.

JOHNSON AUTOMATIC TEMPERATURE CONTROL

FOR ALL TYPES OF INDUSTRIAL APPLICATIONS

Processing • Heating • Cooling • Humidifying
Dehumidifying • Ventilating • Air Conditioning

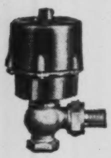
PROCESS CONTROL. Automatic temperature and humidity control for a wide range of manufacturing and industrial process applications. Thermostats, special controllers, valves and dampers applied to tanks, dryers, vats, kettles, curing rooms, coolers, kilns, ovens and other processing equipment.

SPACE CONTROL. Automatic control of room temperature and humidities applied to radiators, radiant heating, unit ventilators, unit heaters and heat delivery ducts. Johnson equipment includes a complete line of thermostats, thermometers, pressure regulators, humidostats, humidifiers, valves, dampers, damper operators, switches, special controllers and related apparatus.

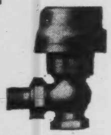
NATIONWIDE SERVICE. Johnson's own full time engineers and installation men are available at branch offices across the nation. Whether your problem involves a complete system or merely a single controller, take advantage of Johnson's nearly 70 years' experience in solving all types of control problems.

DIAPHRAGM VALVES FOR STEAM AND LIQUIDS

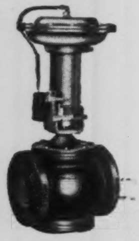
V-103 N.O. Globe Valve. ½" to 8" sizes. *Send for Bulletin V-103.*



V-153 Sylphon Diaphragm Valve for low pressure steam. Sizes ½" and ¾". *Send for Bulletin V-153.*

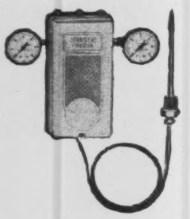


V-111 Sylphon Radiator Valve for low pressure steam. Sizes ½" to 2". *Send for Bulletin V-111.*



V-105 N.C. Globe Valve with V-510 Pilot Positioner. *Send for Bulletins V-105 and V-510.*

MASTER-SUBMASTER CONTROL FOR STEAM, LIQUIDS OR AIR

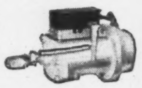


T-900 Remote Bulb Master Thermostat. *Send for Bulletin T-900.*

T-901 Remote Bulb Submaster Thermostat. *Send for Bulletin T-901.*

PISTON OPERATORS

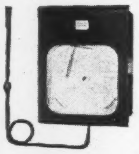
D-251 Long-Stroke Piston Operator.



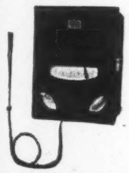
Pilot Positioner Applied to Piston Damper Operator.

For dampers and similar uses. Compact unit with fully enclosed spring and rubber diaphragm. Adjustable stops. Available with pilot positioner for applications requiring maximum and precise repositioning power. Send for Bulletins D-251 and D-265.

RECORDING AND INDICATING CONTROLLERS FOR TEMPERATURE, PRESSURE, HUMIDITY

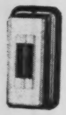


T-1000 RECORD-O-STAT. Records and controls. Built for extreme accuracy under all conditions. Single and two-pen models. Liquid-filled, vapor tension or gas-filled thermal systems. For ranges between minus 125°F. and plus 1000°F. Charts for 24 hours or 7 days. *Send for Bulletin T-1000.*



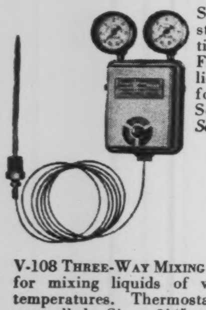
T-1050 INDICATING CONTROLLER For use where no permanent record is required. Easy-to-read scale permits accurate check of the controlled variable. Same measuring and control features as Record-O-Stats. *Send for Bulletin T-1000.*

ROOM TYPE THERMOSTATS

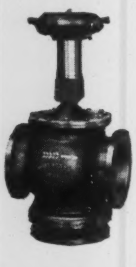


T-403 Single Temperature Thermostat. *Send for Bulletin T-403.*

T-460 *Dual* Two-Temperature Thermostat. *Send for Bulletin T-460.*



Series T-800 Thermostats for steam, liquids or air. Proportional or two-position action. Furnished with remote bulb for liquids or air; rigid stem models for insertion or immersion. Separable sockets available. *Send for Bulletin T-800.*



V-108 THREE-WAY MIXING VALVE for mixing liquids of varying temperatures. Thermostatically controlled. Sizes 2½" to 10". Rubber diaphragm. *Send for Bulletin V-108.*

JOHNSON CONTROL

TEMPERATURE ⇅ AIR CONDITIONING

PLANNING • MANUFACTURING • INSTALLING • SINCE 1885

JOHNSON SERVICE COMPANY

507-PP East Michigan Street
Milwaukee 1, Wisconsin

Please send me the following free Product Bulletins:

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☐ V-153
☐ V-111
☐ V-105
☐ V-510
☐ T-900
☐ T-901
☐ D-251
☐ D-265
☐ T-1000
☐ T-403
☐ T-460
☐ T-800
☐ V-108
☐ *New Condensed Catalog of all Johnson Products*

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For more information circle **21** on inquiry card.

Servospeed HEART OF AUTOMATION

MODERN ELECTRONIC ENGINEERING GIVES PRECISE MOTOR SPEED CONTROL

Modern industrial electronic engineering has been coordinated with electric motor design to provide a versatile means for obtaining the full possible advantage of speed control in DC motors while operated from the regular alternating current power line. Grid controlled "Thyratron" tubes are utilized for power controlled stepless variation to supply motor armature power. Patented feedback, or "Servo" circuits provide constant torque capability over wide speed ranges of as high as 60 to 1 in some models and a minimum of 20 to 1 in others.

Servospeed
DIV. of ELECTRO DEVICES, Inc.
4 Godwin Ave., Paterson, N. J.
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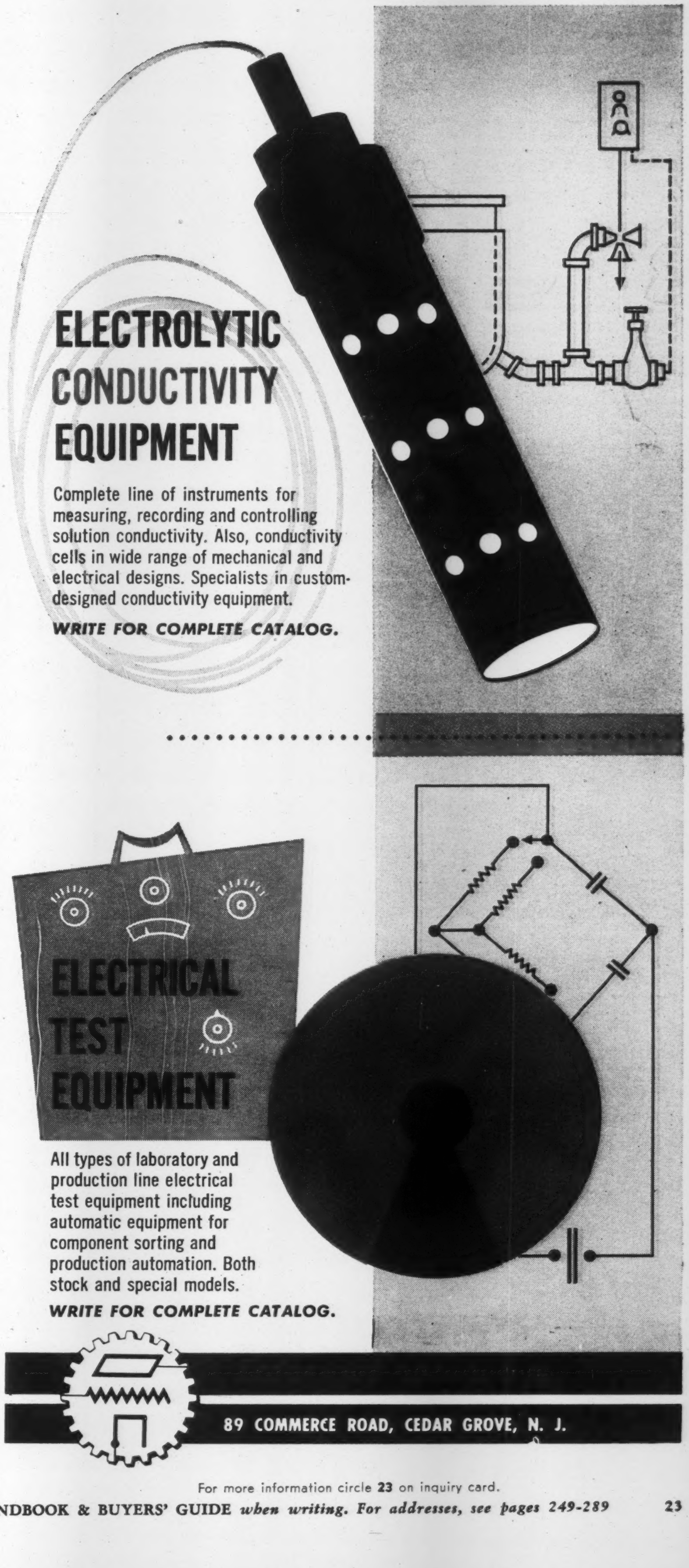

ELECTROLYTIC CONDUCTIVITY EQUIPMENT

Complete line of instruments for measuring, recording and controlling solution conductivity. Also, conductivity cells in wide range of mechanical and electrical designs. Specialists in custom-designed conductivity equipment.

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ELECTRICAL TEST EQUIPMENT

All types of laboratory and production line electrical test equipment including automatic equipment for component sorting and production automation. Both stock and special models.

WRITE FOR COMPLETE CATALOG.

89 COMMERCE ROAD, CEDAR GROVE, N. J.

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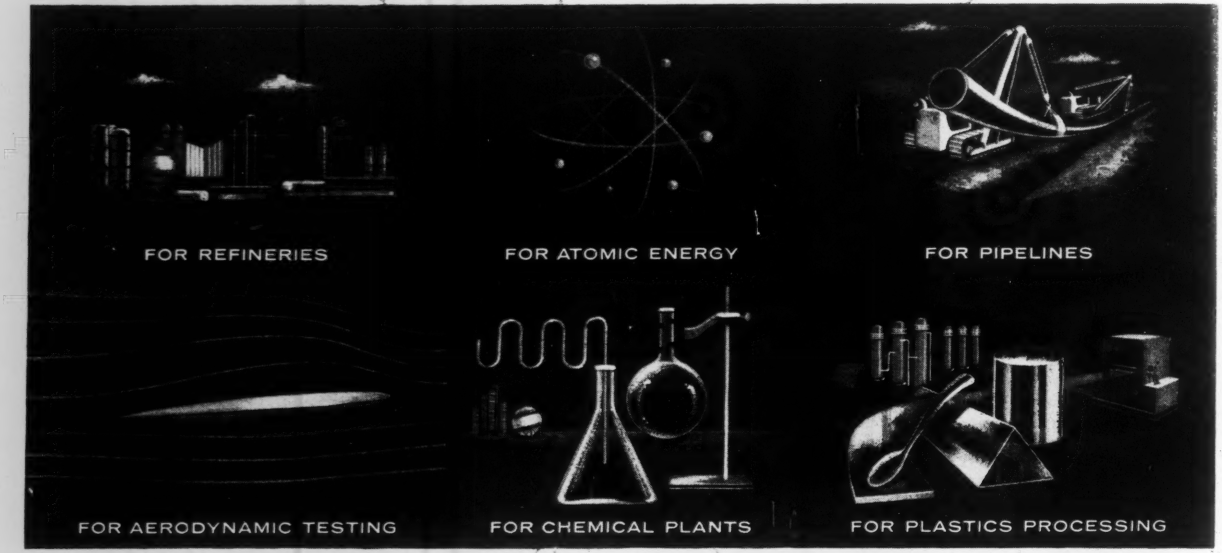
GO AUTRONIC


FOR REFINERIES
FOR ATOMIC ENERGY
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FOR AERODYNAMIC TESTING
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FOR PLASTICS PROCESSING

Without adequate process control systems your new plant can quickly slide from competitive . . . to obsolescent . . . to *obsolete.*

Modern, high efficiency plants keep obsolescence at bay the all-electronic way—with Swartwout Autronic Controls.

You'll go all-electronic eventually *—Go Autronic now with Swartwout, pioneer and leader in electronic process controls.*

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Swartwout
AUTRONIC® CONTROL SYSTEMS

The Swartwout Company
18511 Euclid Avenue • Cleveland 12, Ohio

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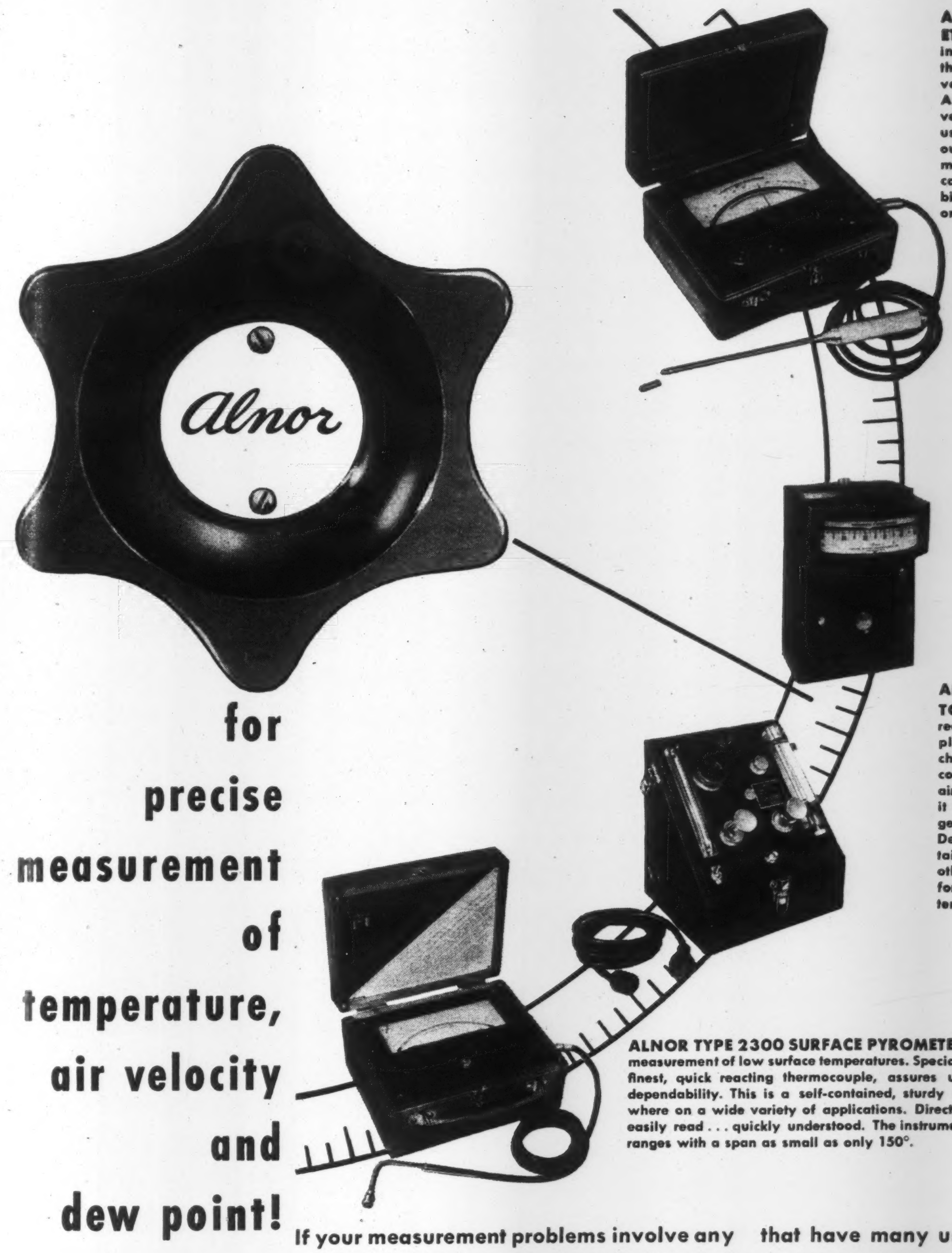

for precise measurement of temperature, air velocity and dew point!

ALNOR THERMO-ANEMOMETER Here's a compact, direct-reading instrument that fills a long-felt need—the accurate measurement of low air velocities. With the Alnor Thermo-Anemometer you can accurately read velocities as low as 5 f.p.m. It can be used between 20°F. and 150°F. without impairing its accuracy. Fine craftsmanship, high-quality materials, exact calibration, and exhaustive tests combine to assure you accurate operation on a wide variety of applications.

ALNOR ELECTRONIC TEMPERATURE CONTROLLER . . . is a simplified form of controller designed to indicate and regulate automatically the heat of any industrial heating device. There are no moving mechanical parts to wear or cause trouble. Control sensitivity is such that pointer movement of 0.3% will activate the power relay. Available with a wide variety of thermocouples and in scale range from 0-500 to 0-3000°F.

ALNOR DEW POINT INDICATOR . . . for simple, rapid dew point reading of any gas. Indication takes place in an enclosed observation chamber under accurately controlled conditions. Dew or fog suspended in air—not on mirrored surface—makes it easy for two or more observers to get same accurate results. The Alnor Dewpointer is a complete, self-contained unit—no external coolant or other apparatus is required. Available for dew points from −80° F. to room temperature.

ALNOR TYPE 2300 SURFACE PYROMETER . . . sets a new high in precision measurement of low surface temperatures. Special design, from Alnico magnet to the finest, quick reacting thermocouple, assures unfailing accuracy . . . speed and dependability. This is a self-contained, sturdy unit—easily carried and used anywhere on a wide variety of applications. Direct reading, six-inch mirrored scale is easily read . . . quickly understood. The instrument is available in 5 Fahrenheit scale ranges with a span as small as only 150°.

If your measurement problems involve any of these, choose a precision instrument from the Alnor line. Unexcelled for unfailing accuracy, Alnor instruments have proved their superiority in a broad range of laboratory, production-line and field applications. The units shown are but a few from a full line of rugged precision instruments that have many unique patented features that mean greater accuracy . . . a more practical, trouble-free solution to your measurement problems.

Follow the lead of those who know quality best . . . select Alnor for your laboratory or industrial instrumentation.

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420 N. LA SALLE ST. • CHICAGO 10, ILL.

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

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Send complete information on the following:
☐ Electronic Controller ☐ Dew Point Indicator
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For more information circle **25** on inquiry card.

PETROMETER CORPORATION

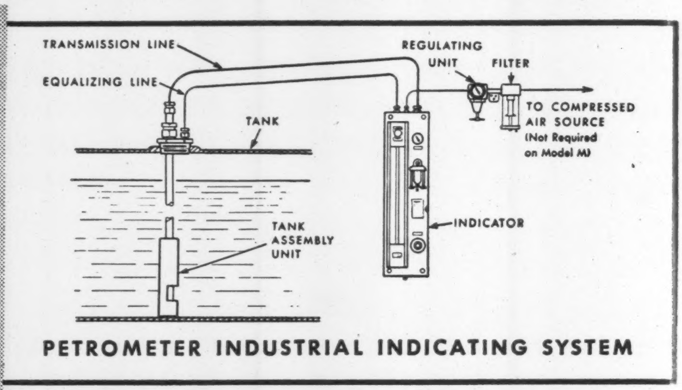
43-22 Tenth St. **Long Island City 1, N. Y.**
Tel—STillwell 4-8042

Petrometer Remote Reading LIQUID DEPTH GAUGES

SERIES 1400

For Accurate, Reliable Measurement of Depth of Liquid in Storage Tanks and Process Vessels. Operates on the principle of hydrostatic pressure... No moving parts... No electrical connections. Gives true reading of contents of tanks above or below the ground.

The Petrometer Industrial Indicating System consists of 5 basic parts: (1) The Indicator, (2) The Tank Assembly Unit, (3) A copper tube transmission line, (4) A copper equalizing line and (5) A manual or automatic source of compressed air for purging the transmission line.

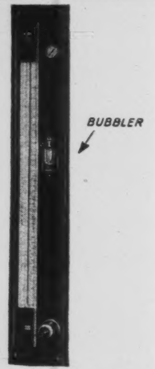


PETROMETER INDUSTRIAL INDICATING SYSTEM

FOUR *NEW* MODELS TO CHOOSE FROM . . .

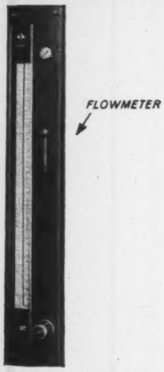
MODEL 1400 A

Equipped with aerator valve for semi-automatic indication.



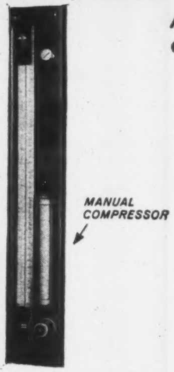
MODEL 1400 B

Equipped with bubbler to give visable evidence of continued aeration. Readings are automatic.



MODEL 1400 F

Equipped with flowmeter in lieu of bubbler.



MODEL 1400 M

Equipped with manual compressor for installations where there is no source of compressed air.

All 1400 Models are obtainable in 8 types for different tank depths.

All Petrometer Series 1400 Models, A, B, F and M have these design features:

(1) "Sealed In" Indicating Liquid. Cannot spill during transit.

(2) A one-piece extruded aluminum indicating unit with separate channels for scale and window.

(3) All functional parts are contained on the instrument panel — none on the mounting plate or as separate units.

(4) Easy Installation. Simply mount back cover on wall and plug the instrument panel into the female receptacles for quick-lock fastening.

Send For
Bulletin 6004A

Petrometer

HOW TO SELECT THE *Right* GAUGE . . .

KEY NUMBER	TYPE	INDICATING FLUID
1 to 64	442	RED-X
65 to 96	443	RED-X
97 to 120	444	RED-X
121 to 144	445	RED-X
145 to 164	446	RED-X
165 to 270	552	MERCURY
271 to 410	553	MERCURY
411 to 520	554	MERCURY
521 to 610	555	MERCURY

To determine the right type:

1. Multiply the vertical depth of the tank in inches by the Specific Gravity of the liquid. This result is the key number.
2. Using the key number select the correct type from the table.

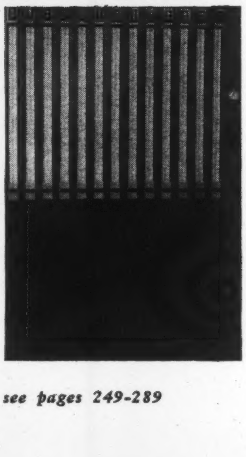
To determine the right model:

1. If compressed air is available select one of 3 models, A, B or F, described above.
2. If no compressed air is available use Model M. Tank assemblies available in brass, stainless steel, Monel, nickel, aluminum, lead, black iron, uscolite plastic. Transmission and Equalizer tubing available in multiples of 10 feet.

MULTI-GAUGE PANEL UNITS

Petrometer Series 1400 Indicators can be obtained in multiple units incorporated on a single panel and mounting plate to meet your specifications. Ideal for central control systems.

Petrometer Indicating Units, component parts and all accessories can also be purchased separately.



For more information circle **26** on inquiry card.

FIRST *Really New* RELAY

TO MEET TODAY'S RIGID REQUIREMENTS

PERFECTED BY THE

A. W. HAYDON CO.

This miniature, hermetically-sealed, general purpose relay has been designed with increased magnetic force to provide higher contact pressures and greater travel than are usually found in this type. Special care has been taken to assure reliable operation in low level circuits.

Rated Load: 2 amperes, 28 Volts DC, resistive. Ambient Temperature Range: 65° C to 125° C. Vibration: 15g to 2,000 cps — no contact chatter. Shock: 50g, 11 milliseconds — no contact chatter. Write for Bulletin AWH RY 1001.

electro-poise.
RELAY
PATENTS PENDING
THE A.W.HAYDON COMPANY
WATERBURY, CONN.

TYPE 300 COUNTERBALANCED RELAY

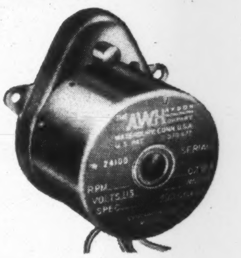
WITH SEPARATELY SEALED CONTACT CHAMBER

Uniquely designed with contacts isolated from coil. Contacts can never become contaminated with vapors or gas from organic insulating materials.

TIMING AND CONTROL DEVICES BY THE A. W. HAYDON COMPANY ARE RECOGNIZED AS THE MOST DEPENDABLE PERFORMERS IN THE FIELD.

400 CYCLE MOTORS

Reversible — Light weight (8 ounces). 115 volts ± 10%; 55 milliamps. Torque: 0.025 oz-in at 3000 rpm. Meet Military Requirements. Write for Bulletin AWH MO 803.



MINIATURE HERMETICALLY SEALED TIMERS

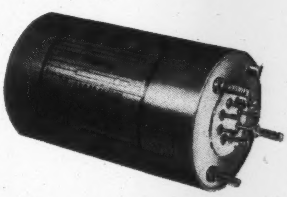
Supplied in 2½" diameter housing. Optional mounting and electrical termination.

TIME DELAY RELAYS

Single or multiple switching. Delay periods from 2 seconds to 3 hours. Write for Bulletin AWH TD 400.

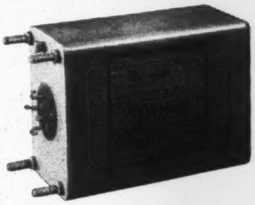
REPEAT CYCLE TIMERS

Single or multiple switching. Wide Range of Time Cycles. Write for Bulletin AWH RC 200.



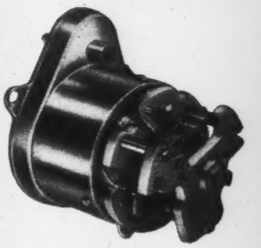
PROPORTIONAL DELAYED RESET TIME DELAY RELAY

Provides a controlled reset rate. Designed to meet special applications. Hermetically sealed or enclosed in dust cover. Meets military requirements. Write for Bulletin AWH TD 402.

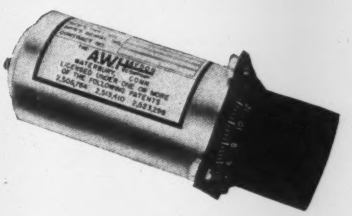


GOVERNED DC MOTORS

The A. W. Haydon Company now offers 3 series of Chronometrically Governed DC Motors. Each designed to do the same job in a different application.
5700 Series — non-military applications where extreme temperature, vibration and shock are not experienced.
5600 Series — Aircraft and military applications where extreme temperature and moderate vibration and shock are encountered.
5800 Series — Aircraft and missile applications where extreme temperature, vibration, and shock are encountered. Write for Bulletin AWH MO 800, -801, -802, -804.

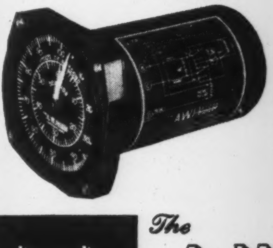


SPECIAL TIME DELAY RELAY



Supplied in 2.2" diameter housing. Precision unit: ± 1% accuracy. Meets military requirements. Adjustable over wide range. Write for Bulletin AWH TD 500.

STOP CLOCKS



20-30 Volts DC. Precision Movement — Electrical Reset Temperature Range -65°F to 185°F. Option on mounting and electrical termination. Write for Bulletin AWH ET 700.

FOR FULL PARTICULARS ON COMPLETE LINE OF THE A. W. HAYDON COMPANY'S ELECTRO-MECHANICAL DEVICES, WRITE FOR CATALOG, Dept. IAH.

The
A. W. HAYDON
COMPANY
228 NORTH ELM STREET
WATERBURY 20, CONNECTICUT

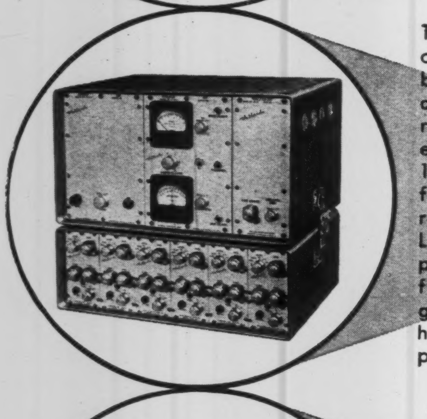
Design and Manufacture of Electro-Mechanical Timing Devices

For more information circle **27** on inquiry card.

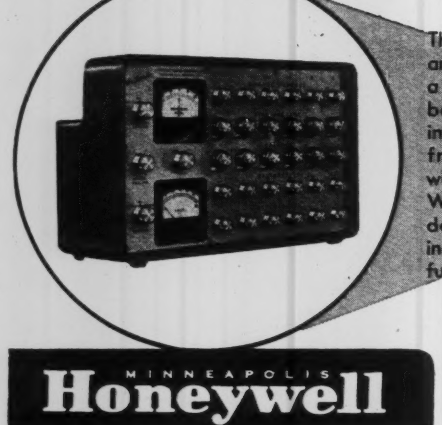
the Heiland dynamic recording system gives you more...

- VERSATILITY
- PERFORMANCE
- EASE OF OPERATION
- FOR RELAY RACK OR TABLE MOUNT

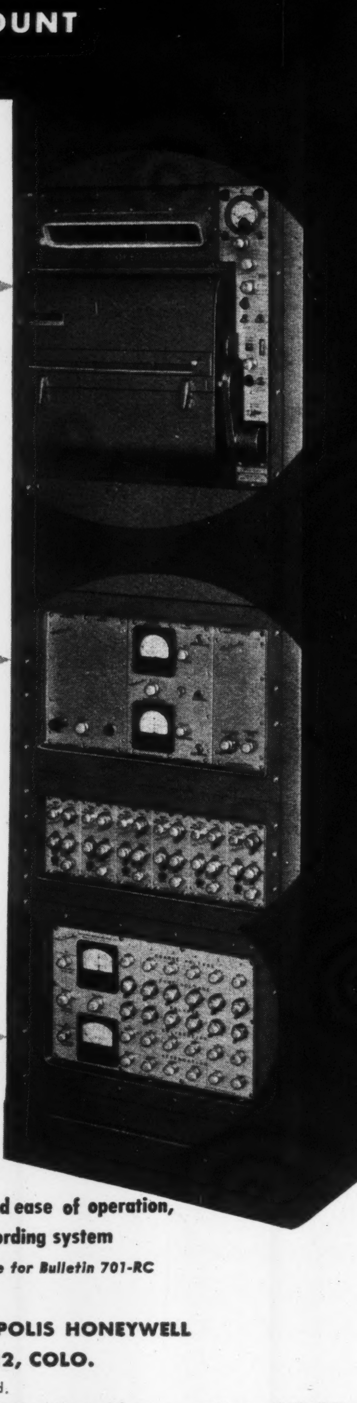
The Series 700 oscillographs feature 8" paper width with 1-36 channels, or 12" paper width with 1-60 channels. Available for 28 v.d.c. or 115 v.a.c. operation, the 700 Series has paper speeds adjustable from .030 to 144"/sec., and writing speeds in excess of 20,000"/sec. Separate supply and take-up drums are light-weight—and light tight for easy daylight loading.



The Heiland 119 Amplifier System offers up to 6 channels, in any combination, of either linear-integrate amplifiers or carrier amplifiers. Carrier amplifier channels provide linear frequency response from 0 to 1000 CPS, for resistive, linear differential transformer, or variable reluctance type transducer inputs. Linear-integrate amplifier channels provide linear frequency response from 5 to 3000 CPS for self-generating transducers. Provides high-amplitude recording up to 8" peak to peak deflection.



The Heiland 82-6 Bridge Balance and Strain Indicator Unit provides a simple and accurate means of balancing, calibrating and measuring static and dynamic phenomena from resistive-type transducers where you don't need amplification. When used as a strain-indicating device without an oscillograph, an input of 25 microamperes produces full scale on the indicating meter.



For versatility, performance, and ease of operation, choose the Heiland dynamic recording system

For details and specifications, write for Bulletin 701-RC

MINNEAPOLIS
Honeywell
Heiland INSTRUMENTS

HEILAND DIVISION OF MINNEAPOLIS HONEYWELL
5200 E. EVANS AVE., DENVER 22, COLO.

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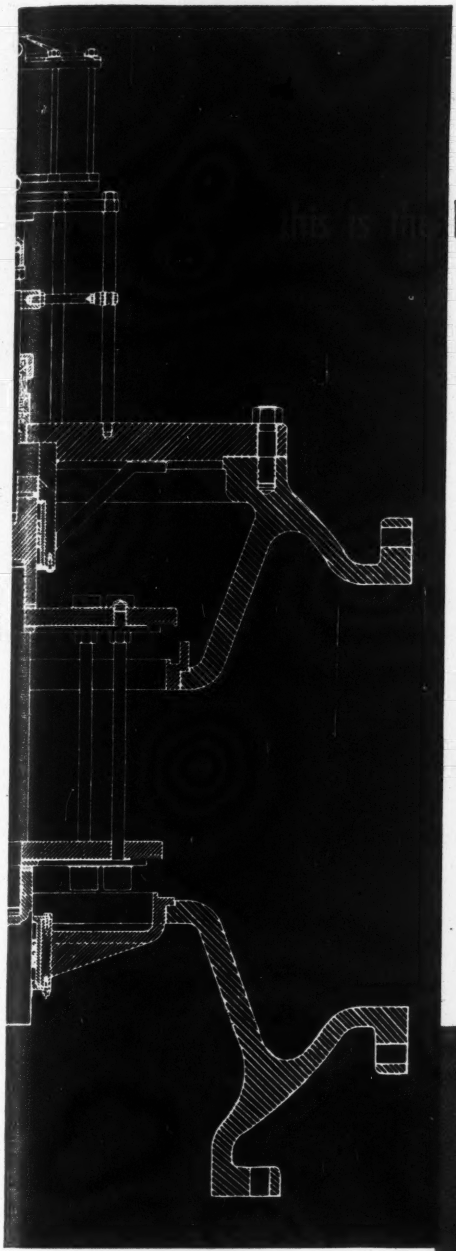


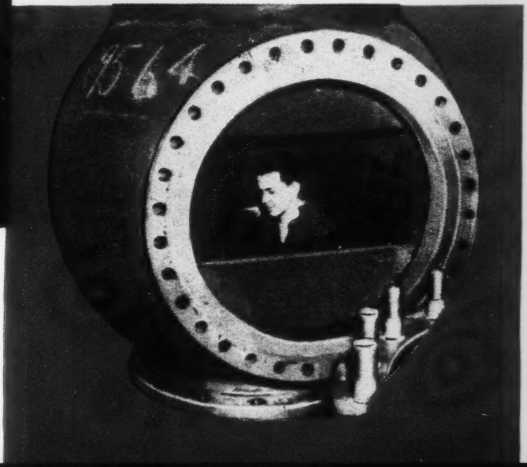
this is the largest double-seated control valve ever made

When you are talking *big* control valves, talk to Kieley & Mueller. K&M is the largest manufacturer of the big ones, control valves above 16 inches. Standard globe-type valves are available in 20, 24, 30 and 36 inch sizes; even larger valves will be produced on special order.

This 36-inch double-seated angle valve closes snugly on giant Teflon seats. The inner valve positions responsively, gliding on special roller-slide bearings. It's massive, but is operates protected by a K&M patented torque resistor. Beyond the problem of size, this valve is mounted on its side, and it has been performing creditably for over four years.

BIG or small, if it's control valves, you'll like the pitch-in, helpful approach of your local K&M representative . . . plus capable engineering and manufacturing follow-thru at the K&M plant.

Write for Bulletin CV-53.



ABOVE: Partial cross-section of K&M 36-inch valve showing general construction.

AT RIGHT: Actual size of a 36 inch valve can be visualized from this illustration of a workman inside the valve body performing finishing operations.

KIELEY & MUELLER, INC.

K&M

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78th Anniversary . . . Oldest U.S. Pressure and Level Control Valve Manufacturer

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Sub-Miniature Potentiometers

±.3% linearity or better—highest resolution

Answer your potentiometer needs with these space and weight saving, yet highly accurate and dependable units. . . . the result of 4 years' development and over a year of successful use by leading manufacturers of commercial and government electronic equipment.

ACEPOT . . . the smallest wire-wound precision potentiometer on the market . . . offers you outstanding features packed into the tiniest possible size. Special design, new materials, and unique manufacturing and testing techniques assure you of the precision accuracy and dependability you usually get only in much larger units. You know Acepots *meet specifications* before they are shipped, for each Acepot is performance tested and a Polaroid picture record is supplied showing linearity and resolution.

Condensed Specifications

size: ½" x ½"
weight: 1/4 oz. including lock washer and nut
resistance range: 10Ω to 250K standard, ±2%. Higher or lower on special order
linearity: ±.3%
resolution: extremely high
torque: .035 oz./in. @ 20° C.
power rating: 2 watts for 60° C. rise
ambient temperature: —55° C. to 125° C.
case: one-piece precision machined aluminum, corrosion-resistant bushing
standard threaded bushing, servo or flush mountings, and ganged units
special shaft lock is self-contained; no addition to size
indexing pin provides non-rotational mounting
all units fully sealed, moisture-proofed, anti-fungus treated
meets applicable portions of JAN specs and MIL-E-5272A standards

ACETRIM . . . a new standard in sub-miniature wire-wound potentiometer trimmers, at a low price. Here again, through our special design, unique manufacturing and testing techniques, and use of new materials, you get precision accuracy and dependable performance in an ultra compact space and weight saving unit.

Condensed Specifications

size: 1/2" x 1/2"
weight: 1/4 oz. including lock washer and nut
resistance range: 10Ω to 150K standard, ±3%. Other values on special order
linearity: ±3%
resolution: excellent
torque: low or high as required
power rating: 2 watts for 60° C. rise
ambient temperature: —55° C. to 125° C.
case: one-piece precision machined aluminum, corrosion-resistant bushing
standard threaded bushing, servo or flush mountings, and ganged units
special shaftlock is self-contained; no addition to size
indexing pin provides non-rotational mounting
all units fully sealed, moisture-proofed, anti-fungus treated
meets applicable portions of JAN specs and MIL-E-5272A standards

Prompt delivery on prototypes or production quantities (prototype orders handled by special department to render expedited service).

Consult Ace Electronics Associates about your next potentiometer or trimmer need and you'll be sure of high precision, fine linearity and dependable space and weight saving units to meet your most exacting requirements. Send for complete Fact File, prices, and delivery schedules.

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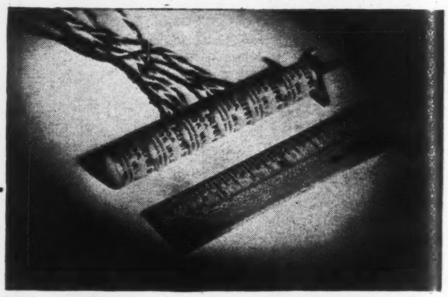
ACEPOT*

sub-miniature potentiometers

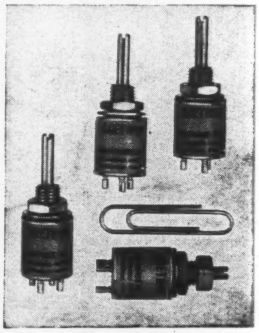
X-500 sub-miniature ACEPOT operates from —55° C. to a new high of 150° C.



Available single or up to 6-gang units on one shaft.

ACETRIM*

sub-miniature potentiometer trimmers



Potentiometers and Trimmers to RETMA specifications

featuring outstanding characteristics

Here again, Ace's special techniques and designs, plus the extensive experience in sub-miniaturization, assure outstanding performance. Ace standard size wire-wound, precision potentiometers and trimmers have higher resistance range and resolution per size than ever before possible. Specify Ace and be sure of precision accuracy, extremely fine linearity, outstanding dependability, and long life. Available in 1/2", 7/8", 1", 1-1/16", 1-1/2", 2", 3", sizes . . . standard, special, prototypes, and production units. Prototype units expedited in special order department.

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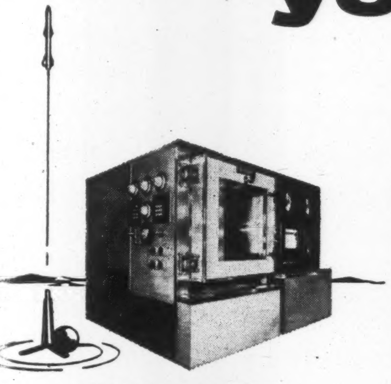
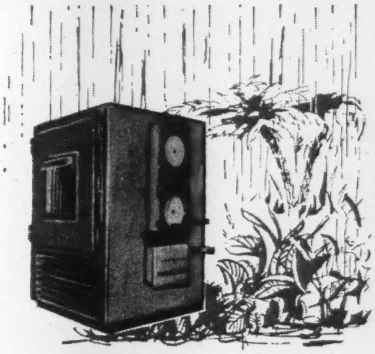
WITH Tenney ENVIRONMENTAL TEST EQUIPMENT . . .

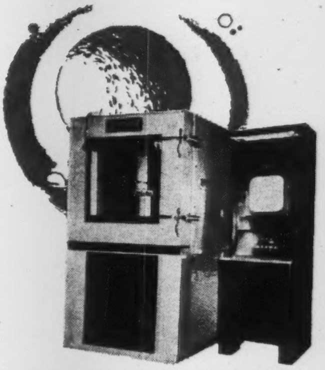
you are there



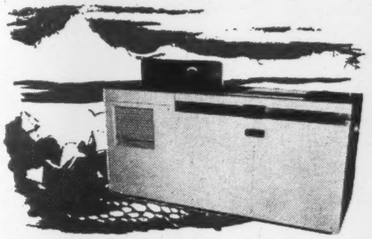
. . . at altitudes of 100,000 ft.
and temperatures of minus 100° F!



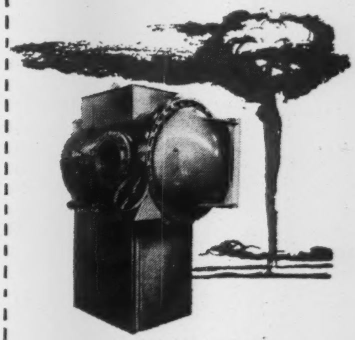
. . . at programmed relative humidity
from 20 to 100%!



. . . at minus 120° F or plus 500° F!



. . . at minus 150° F!

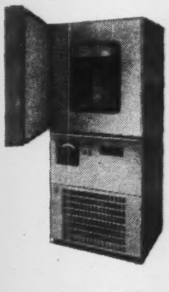


. . . in a violent explosion!

Tenney Environmental Test Equipment simulates these and *many* other climatic conditions. The largest engineering staff in the industry insures advanced-design, performance-proven test chambers to meet the most exacting specifications.

Special counseling service in custom-made installations or for modifying present installations is now available from Tenney Engineering. A separate engineering section has been set up to design and construct "custom" chambers for difficult or unique services and installations.

For more complete information about Tenney products and specialized engineering counseling service, write today.



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TENNEY-MITE Chamber
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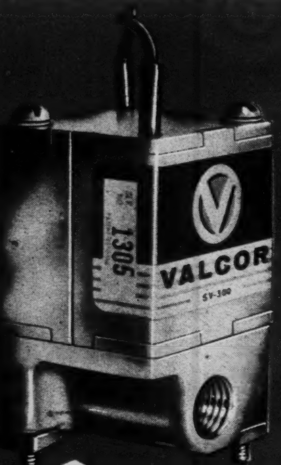
GET VALCOR INTO YOUR SYSTEM

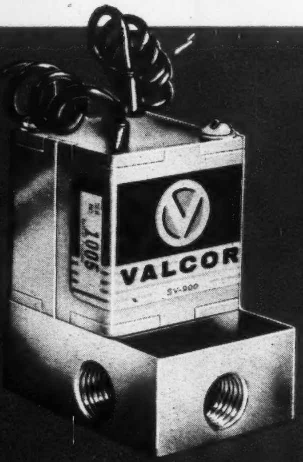


Series SV-300 2 Way Brass Body

Normally Closed. For use with water, oil, air and gases.
Pipe Size: ⅛" or ¼" N.P.T.
Elec.: 115V-60 cy., 10 watts
Max. Pressure: 125 lbs.

Series SV-900 3 Way Brass Body

For use with water, oil, air and gases.
Pipe Size: ¼" N.P.T.
Elec.: 115V-60 cy., 10 watts
Max. Pressure: 125 lbs.
Normally Closed or Normally Open



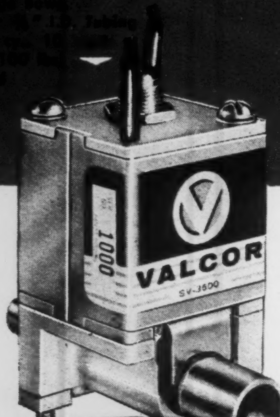
Series SV-1000 4 Way Brass Body

For use with water, oil, air and gases.
Pipe Size: ¼" N.P.T.
Elec.: 115V-60 cy., 10 watts
Max. Pressure: 125 lbs.

1006
VALCOR
SV-1000

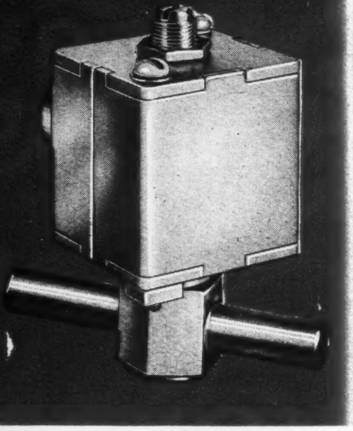
Series SV-3600
2 Way Metal or Plastic Body

For use with oil and all liquids —will handle extra heavy viscosities and large flow.
Male fittings for ⅜" I.D. Tubing
Elec.: 115V-60 cy., 10 watts
Max. Pressure: 100 lbs.
Normally Closed



Series SV-3500
Freon Valve for refrigeration

2 Way—Designed to take full back pressure.
Max. Pressure: 350 lbs.
This valve is manufactured in accordance with standard refrigeration specifications. Quotations on request.



Industry proven VALCOR Solenoid Valves offer the greatest possible performance-to-size-to-cost ratio in the entire field. This high standard of performance is a result of a unique and exclusive combination of features found in no other valve.

VALCOR Solenoid Valves are designed to solve or simplify your system design problems.

Write us today and learn why you should GET VALCOR INTO YOUR SYSTEM!

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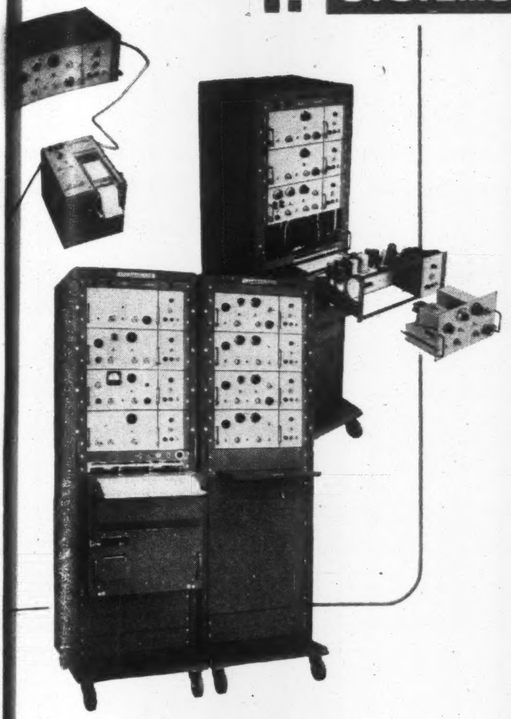
SOLENOID VALVES

VALCOR ENGINEERING CORP.
Carnegie Avenue, Kenilworth, New Jersey

For more information circle 32 on inquiry card.

SANBORN OSCILLOGRAPHIC RECORDING EQUIPMENT

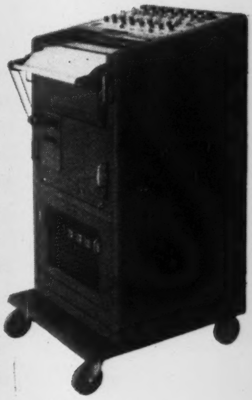
1. SYSTEMS

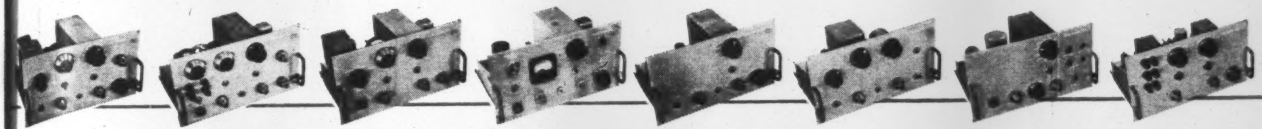


BASIC "150" assemblies housed in either vertical mobile cabinets or separate portable cases are available in 1-, 2-, 4-, 6- and 8-channel models. Each is equipped with driver amplifiers of current feedback design and regulated power supplies for *each* channel, and a recorder featuring *nine* extremely accurate paper speeds on 2- to 8-channel models, five on single channel units. Appropriate plug-in preamplifiers quickly and efficiently equip a basic assembly for recording virtually any 0-100 cps phenomena.

new 8-channel analog system

In addition, *specialized* and complete Sanborn systems from 2- to 8-channels are available for recording *analog computer* outputs. The newest of these is the eight-channel Model 158-5490 illustrated, featuring extreme compactness, mobility and operating ease. Dual-channel DC amplifiers with a common power supply for every two channels measure single-ended or push-pull input signals. Input impedance 5 megohms each input lead to ground. Controls include individual-channel attenuators, position, balance, sensitivity, stylus temperature and paper speed (0.25 to 100 mm/sec.). Frequency response is flat to 20 cycles, down 2 db at 60 cycles for all amplitudes to 4 cm peak to peak.



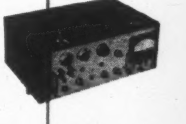


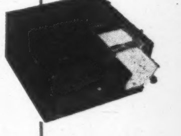
2. PREAMPLIFIERS

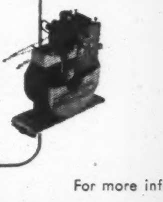
A choice of *twelve* "150 Series" plug-in preamplifiers is now available, to equip systems for any of numerous recording problems. Improved control of input signals results from attenuator ratios of 1, 2, 5, etc., and calibrated zero suppression on AC-DC, Carrier, and Low Level models. Types, in addition to foregoing three, include: Servo Monitor, DC Coupling, Log-Audio, Chopper Stabilized DC, AC Wattmeter, Input Coupling, RMS Volt/Ammeter, 400 cycle Frequency Deviation, and Frequency Meter.

3. UNIT INSTRUMENTS

All Sanborn Preamplifiers and Recorders, as well as various other units, are available separately for specialized applications or use as "original equipment" in other apparatus. Instruments include the Model 150-300/700 Wide Band Driver Amplifier and Power Supply, for use with low power galvanometer elements, a 'scope and/or panel meter. When equipped with suitable "150" preamplifier, this amplifier provides a portable indicator for strain, force, pressure, temperature, AC watts, audio level, etc. Other units include the Model 150-1900 Master Oscillator Power Amplifier: Model 150-3100 Triplexer; Model 601 and 602 galvanometers; Model 150-2900 Dual-Channel DC Amplifier.





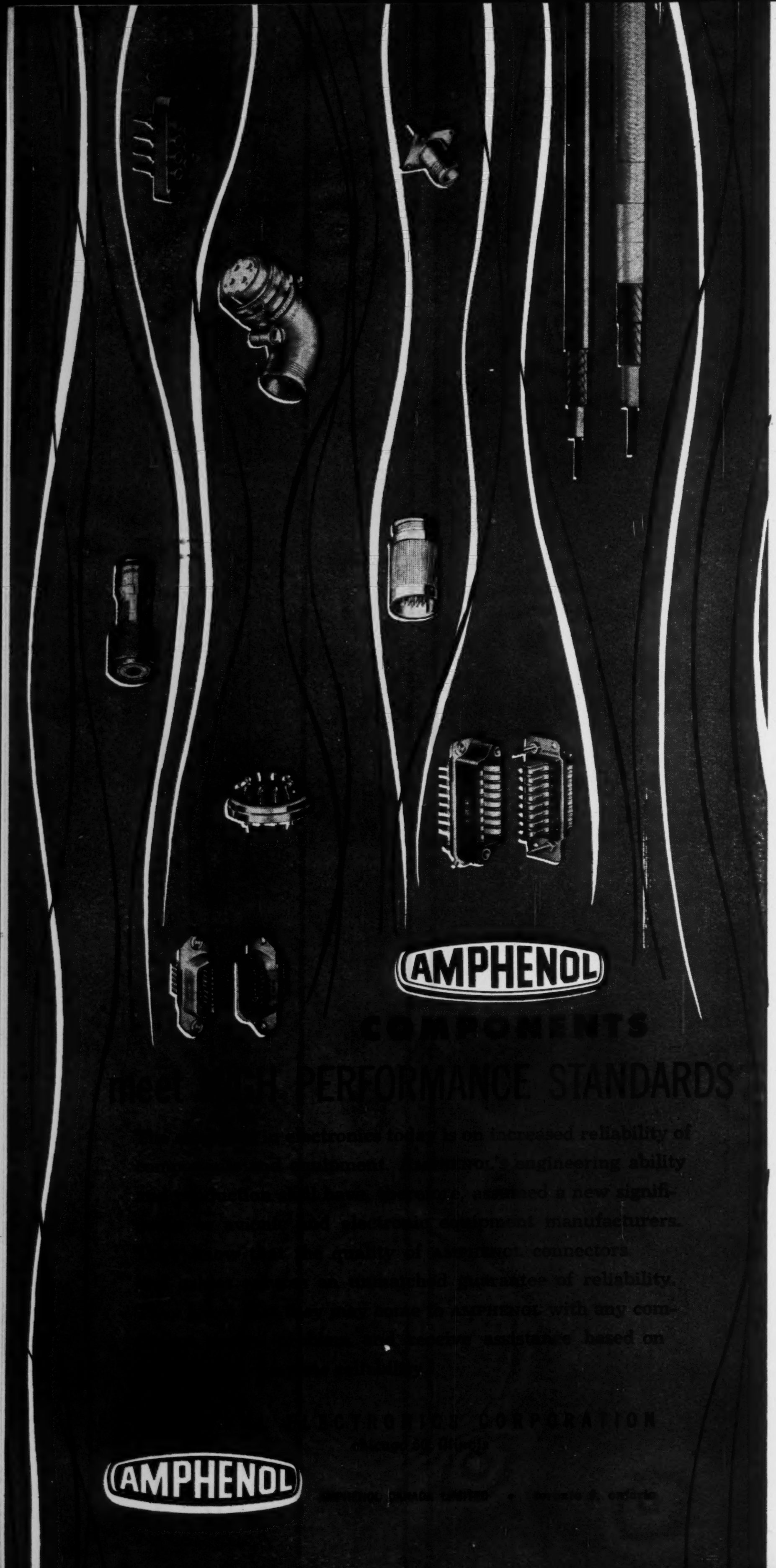


Added to these three aspects of Sanborn Oscillographic Recording Equipment are the basic advantages of inkless recording in true rectangular coordinates, to provide accurate, easily interpreted records; high torque galvanometer (10 ma develops 200,000 dyne cm.); over-all linearity 0.25 mm over entire 4 cm chart width; controls for timing, manual and remote coding.

Take advantage of the scope and flexibility of Sanborn equipment to answer your recording requirements. Sanborn engineers will be glad to provide further information and application assistance whenever you wish. Contact your local representative or write to the main office below.

SANBORN COMPANY
INDUSTRIAL DIVISION
CAMBRIDGE 39, MASSACHUSETTS

For more information circle **33** on inquiry card.



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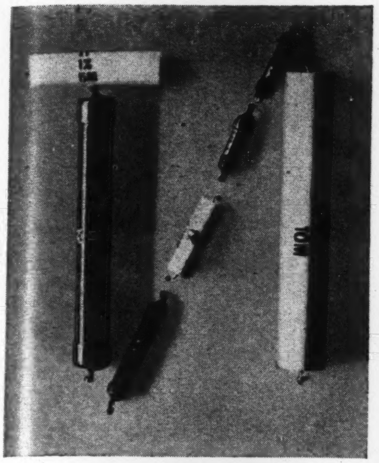

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reliability

with T/I precision deposited carbon resistors

Top dependability in a wide range of applications is provided by durable, economical TI precision resistors. They *maintain* precise resistance value and stable operation — far surpassing performance requirements of MIL-R 10509. Adherence to exacting ± 1% tolerances and meticulous quality control procedures insure the uniform superiority of TI carbon film resistors under adverse operating extremes.

The increased economy and reliability of TI deposited carbon resistors makes their use ideal in electronic computers, test equipment, missile systems, radar systems, carrier equipment, electrical meters, and many other applications.

Industrial Line, MIL-Line, and Hermetically Sealed types — in 5 sizes ranging from 25 ohms to 30 megohms, with ½ watt to 2 watt ratings.

WRITE FOR BULLETIN
DL-C 539

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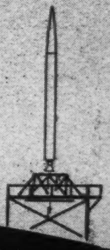
designed specifically
for VANGUARD
EARTH SATELLITE VEHICLE

RAHM

For use with Nitric Acids, 90% Hydrogen Peroxide, UDMH, and other corrosive fuels and oxidants; at temperatures up to 500°F.

These instruments are available in ranges from 10 PSI to 2500 PSI, in absolute or differential configurations.



RAHM INSTRUMENTS INC.
237 Lafayette Street, New York 12, N. Y.

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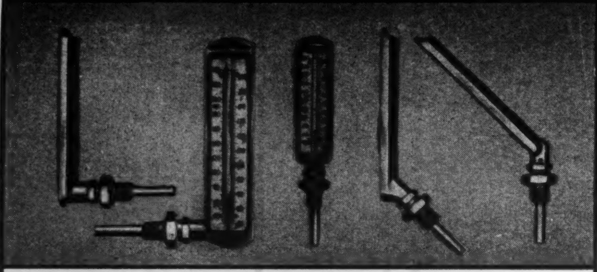
MOELLER INSTRUMENT COMPANY

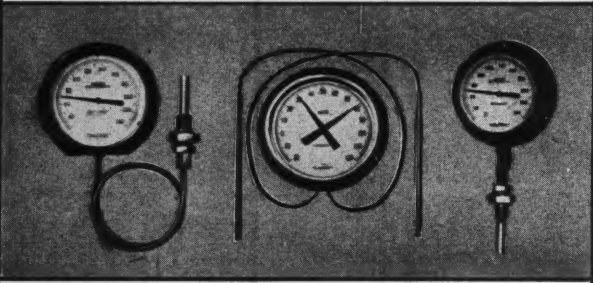
SINCE 1867

132nd STREET & 89th AVENUE, RICHMOND HILL, NEW YORK, N.Y., U.S.A.

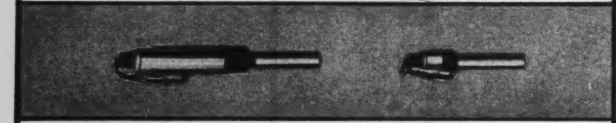
Representatives in Principal Cities



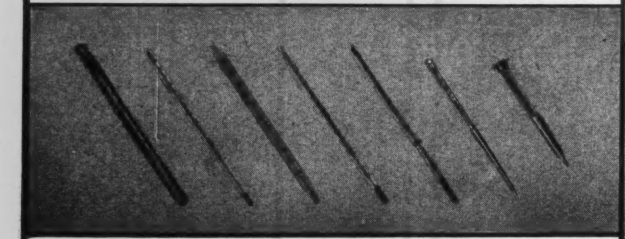
MOELLER INDUSTRIAL THERMOMETERS made in all forms, Straight, Angle, Right Side Angle, Left Side Angle, Reclined and Inclined Angles, in scale ranges from minus 120 to plus 1125°F. or its equivalent in centigrade. Available in 5″, 7″, 9″ and 12″ scale sizes with plain stems, union connection stems and separable sockets in all stem lengths and alloys.



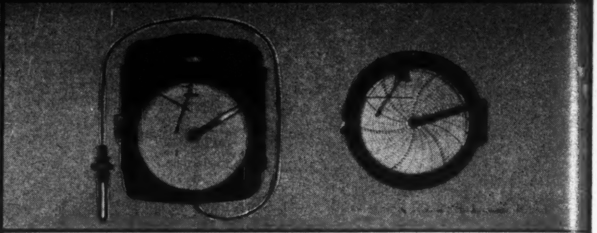
DIAL INDICATING THERMOMETERS, Mercury Actuated, made in 4½″, 6″ and 8½″ sizes with flexible extension tubing. Adjustable rigid stems, single or two pointers, plain bulb, union connection bulb or separable sockets in all lengths and alloys. Scale ranges from minus 40 to plus 1000°F. or its equivalent in centigrade.



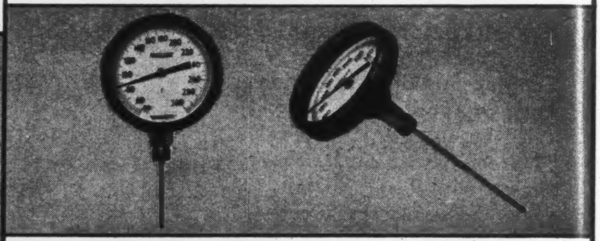
THERMOMETER TEST WELLS, THERMOCOUPLE PROTECTING TUBES and WELLS, made up in all sizes and alloys.



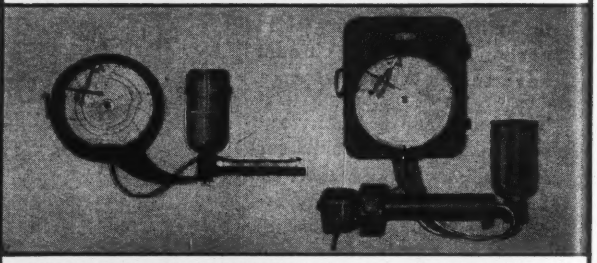
ENGRAVED STEM and PORCELAIN and PAPER SCALE THERMOMETERS made in ranges from minus 150 to plus 1125°F. or its equivalent in centigrade. Available in standard and extreme precision grade. Made to meet specifications of the Government, A.S.T.M. and other authoritative bodies.



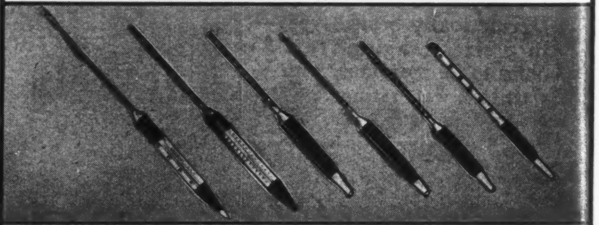
RECORDING THERMOMETERS, Mercury Actuated, made in the round or rectangular cases. Charts 10″ or 12″, 1 hour, 12 hour, 24 hour or 7 day. Ranges from minus 40 to plus 1000°F. or its equivalent in centigrade. Made in remote reading, direct reading, portable and self contained styles. Plain stems, union connection stems and separable sockets in all stem lengths and alloys.



MOELLER BI-METAL THERMOMETERS are actuated by a powerful, specially processed bi-metal helix. Made in 5″ and 3″ diameter case size. Rigid stainless steel stem, can be furnished with union connection stem and separable socket in all alloys. Scale ranges from minus 100 to 1000°F or equivalent in centigrade.



RECORDING PSYCHROMETERS, Mercury Actuated. Round and Rectangular Case, 12 hour, 24 hour or 7 day charts, self contained or remote reading, with or without motor driven fan.



HYDROMETERS PLAIN FORM or COMBINED with THERMOMETER. Made in all scales specific Gravity or Baume for heavy and light liquids. Brix, Twaddle, Ballings Scales, etc. available for all liquids. Standard and commercial grades.

For more information circle **37** on inquiry card.

FEDERAL
HAS THE RIGHT GAGE FOR EVERY JOB

Whatever your dimensional inspection requirement, you can find in Federal's most extensive line just the gage or gaging system you need:

Dial Indicators

Dial Indicator Gages

Modified Gages

Air Gages

Automation Gaging Systems

Automatic Gaging and Sorting

From both an economical and practical operating standpoint, it's important to select the *right* gage for your job. Since we specialize in gages utilizing all modern gaging systems and are thoroughly acquainted with gaging techniques, we can impartially recommend the *right* gage to do your job successfully. Call us about your requirements.

Federal Products Corporation
1105 Eddy Street, Providence 1, R. I.

FEDERAL'S SOLUTION TO THE COST OF GAGING:
Impartial Gage Selection
Engineering Follow-Through
Everything in Gages

DIAL INDICATORS

Dial Indicators are lowest in first and last cost. Capable of gaging up to one ten-thousandth of an inch (.0001") and sometimes to half a tenth (.00005"), they are exceedingly adaptable, fast, and simple, — the most universally used type of gage. Ask for Catalog 55.

DIAL INDICATORS
For DIMENSIONAL CONTROL

DIAL INDICATOR GAGES

DIAL INDICATOR GAGES

The Federal line is complete — includes all types of Dial Indicator Gages . . . snap, hole, depth, caliper, etc., and special. Ask for Catalog 55G.

MODIFIED GAGES

Federal Catalog Gages can often be modified at slight expense to meet special gaging requirements. Bring your problems to us. Ask for Catalog A-445.

MODIFIED
FEDERAL CATALOG GAGES
FEDERAL PRODUCTS CORPORATION

FEDERAL DIMENSIONAIR

AIR GAGES

Gaging with air has its own particular advantages: On such jobs, Air Gages are practically foolproof. With AirProbes they can be applied to dimensions that are inaccessible by other methods. They are, however, higher in price and may be more costly to maintain than Dial Indicators. Ask for Dimensionair Catalog No. 56D.

AUTOMATION GAGING SYSTEMS

Machine tools, glass tube and wire covering machines, etc., can be automatically controlled to produce work which is dimensionally accurate. Ask for Catalog 56AM.

Automation

HIGH SPEED AUTOMATIC GAGING AND SORTING by FEDERAL

AUTOMATIC GAGING & SORTING

Federal uses any and all gaging systems and can select the one best suited for accuracy, speed, and convenience. Federal Gages automatically gage and sort workpieces of all shapes and sizes, from holes .002" diameter in small ⅛" diameter parts, to automobile wheels. Ask for Catalog No. 55 AG.

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

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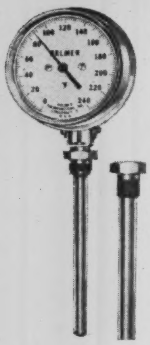
For more information circle **38** on inquiry card.

PALMER a great name in thermometers

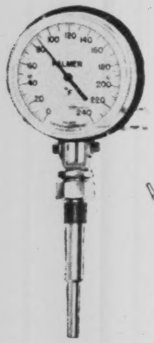


PALMER "DIRECT DRIVE" 3½" DIAL THERMOMETER

An outstanding improvement in mercury actuated dial thermometers with external calibration feature.

- No Sector
- No Pinion
- No Linkage
- Accuracy
- Readability
- Angularity

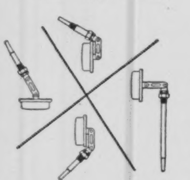
Case . . . stainless steel, compensated for ambient temperature, external calibrating feature. Cover . . . clear plastic, gasket-sealed to stainless steel back-plate. Actuation . . . direct drive Bourdon coil. (No sector, pinion or linkage.) Stem . . . ½" diameter stainless steel, standard lengths: 4"—6"—8"—12", multiples of 6" up to 60" max. . . . Fittings . . . separable socket, union connection (½" or ¾" NPT), flange union.



PALMER 4½" DIAL THERMOMETER

Adaptable and interchangeable with all Industrial Thermometer applications.

MERCURY-ACTUATED. Guaranteed accuracy. Size: 4½" Dial.



Designed for use as STRAIGHT or any ANGLE. With clear vision all-glass moulded case and metal back. Fittings: Plain, Union, Socket; adjustable or union Flanges.

STANDARD RANGES:

−30+130°F.	1°	0+300°F.	2°	0+600°F.	5°
0+150°F.	1°	0+400°F.	5°	+200+750°F.	5°
0+240°F.	2°	0+500°F.	5°	+200+950°F.	5°

or equivalent °C—no extra charge

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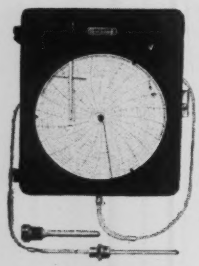


RECORDING and DIAL THERMOMETERS

With Flexible Tubing Connection.

Mercury-actuated, for extreme accuracy. Sturdy construction, very sensitive. All parts rust-proof. Stainless-steel bulb. Wall or Flush Mounting. Bottom or Back connection. Fittings: Plain, Union, Sep. socket; Adj. or Union Flanges.

Ranges: −40 to 1000°F. (or C).

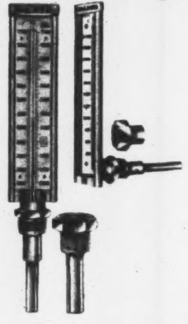
RECORDER: 12" die-cast alum. case; Black or white, satin or wrinkle finish; elec. or spring clock; 12 hr., 24 hr., or 7-day charts. One-pen or multiple pens. Also Fully compensated to correct for Ambient Temperature.

DIAL: 6" and 8" round case. Black or white finish. Easy-reading dial.

INDUSTRIAL THERMOMETERS with "Red-Reading-Mercury"

CASE: 7", 9" or 12" Extruded brass. Wide scale. Chrome finish.

TUBE: Red-Reading-Mercury Easy to Read. Thoroughly annealed for permanent accuracy. Protected by double-strength glass shield. Graduated scale.



Straight

FITTINGS: Fixed thrd., Union, Sep. Socket; adjustable or union Flange; parallel thrd. & locknut; special fttgs. to order.

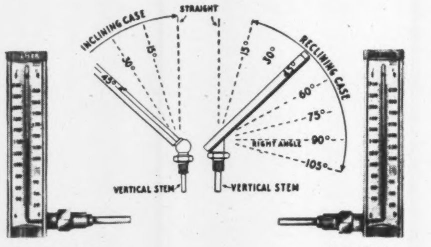
STEM: STRAIGHT and Misc. ANGLES. 3½" to 60", incl. thread.

THREAD: ¾" or 1" NPT (½" not recom.)

STANDARD RANGES:

−40+110°F	2°	+ 50+400°F	5°
0+100°F	1°	+100+550°F	5°
+30+180°F	2°	+200+750°F	5°
+30+240°F	2°	+200+950°F	5°
+30+300°F	2°		

Plain Mercury. Borosilicate tube. Centrigrade equiv.—no extra. Spec. Ranges—cost more.



Right Side

Left Side

●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●

SMALL CASE THERMOMETERS

4" case ⅜" & ½" Fixed Thrd. Fttg.
6" case: ½" & ¾" Sep. Socket Fttg.
Extruded case. Durable Nickel finish.
"Red-Reading-Mercury". Guaranteed accurate.

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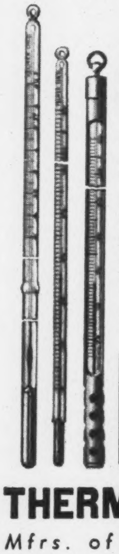

LABORATORY AND PRECISION THERMOMETERS

All glass engraved mercury tube, with vivid RED column. Round or lens; Ring or button top; With or without metal armor; Total or partial Immersion (3" standard). Each in sep. box. All ranges: up to 750°F. (or C. equiv.).

Plain mercury. Borosilicate tube. +200+950°F. Special ranges & dimensions to order. Fractional division, A.S.T.M. etc.

Also handy 5" Pocket style. Annealed and guaranteed very accurate.

REPAIRS—To all makes of mercury Industrial Thermometers. With "Red-Reading-Mercury" (no extra cost) and new Extruded Brass case included. Guaranteed accurate. Reasonable price.

PALMER THERMOMETERS, INC.
Mfrs. of Industrial Laboratory, Recording and Dial Thermometers
2518 NORWOOD AVE., CINCINNATI 12, O.
CANADIAN PLANT: PALMER THERMOMETER LTD., TORONTO, 2

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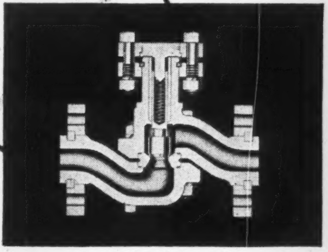
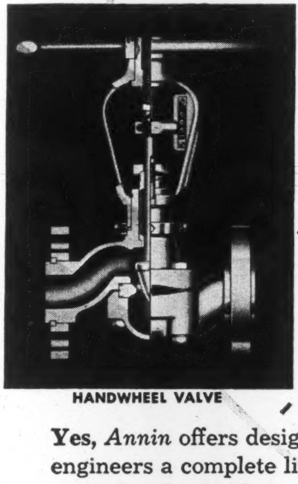
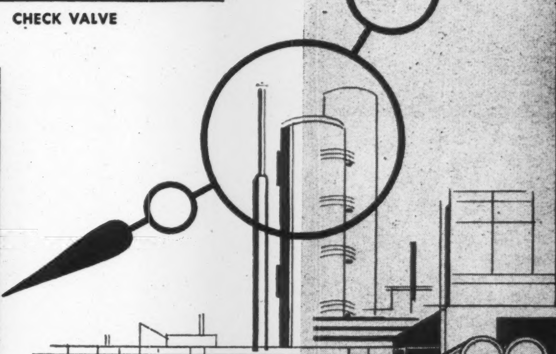
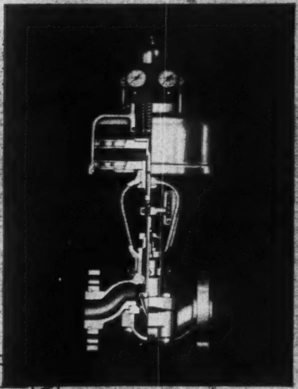
AROUND-THE-CLOCK RELIABILITY with Annin

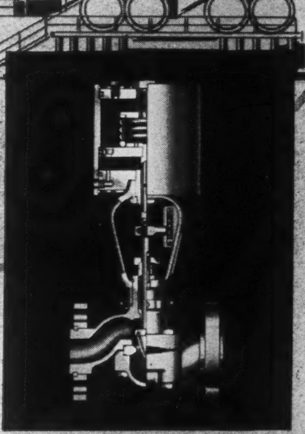
The complete line of Fluid Control Valves to meet every installation requirement


CHECK VALVE


HANDWHEEL VALVE



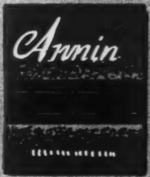

DOMOTOR VALVE


CYLINDER VALVE

Yes, *Annin* offers design and control engineers a complete line of valves for rugged and reliable performance "around-the-clock." Name the installation—rocket stand, aircraft component test facility, chemical plant, refinery, paper mill or power plant—and *Annin* valves will exceed the most critical performance needs, with features like:

- **Piping flexibility**
- **Pressure ratings to 10,000 PSI**
- **Body designs for gases to molten metals**
- **Temperatures from —400°F to +1600°F**
- **Interchangeable operators—Domotor, Cylinder or Handwheel**

ANNIN'S new and comprehensive valve catalog 1500-C is now ready for distribution. Send for your copy today.



ANNIN

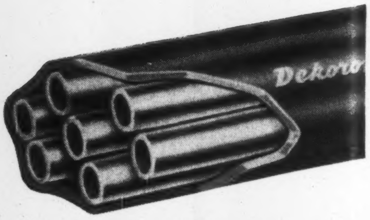
THE ANNIN COMPANY
6570 EAST TELEGRAPH ROAD, LOS ANGELES 22, CALIFORNIA

Control VALVES

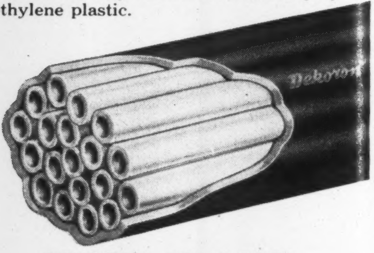
For more information circle **40** on inquiry card.

Dekoron Tubing Products

slash instrumentation costs



DEKORON METL-COR
Instrument line harness of 4, 7 or 10 individual copper or aluminum tubes covered with chemically resistant sheath of polyethylene plastic.



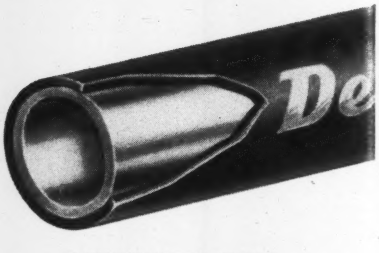
DEKORON POLY-COR
Bundle of 4, 7, 10, 14 or 19 individual polyethylene tubes covered with vinyl plastic. Installs as easily as electric wiring.

DEKORON "M" RIBBON
10 individual copper or aluminum tubes encased in chemically resistant, perforated plastic sheath. One or more tubes can be "peeled" off without special tools.

Dekoron "M" RIBBON

Dekoron "P" RIBBON

DEKORON "P" RIBBON
Same exclusive ribbon construction as "M" Ribbon except that individual lines are made of color-coded polyethylene. For all standard instrument line pressures.



DEKORON TUBING
The original plastic-coated metal instrument tubing. Available with copper, aluminum or steel core tube. Resists chemical attack, outlasts expensive alloy tubing.

Dekoron "P" tubing
SAMUEL MOORE & CO
MANTUA, OHIO

DEKORON "P" TUBING
Highest quality single-line polyethylene instrument tubing. Easy to install; requires no special tools.

Dekoron is more than a name for chemically resistant instrument tubing. The Dekoron trademark now identifies a complete line of tubing products—instrument line harness, tubing, fittings, and accessories for tubing up a pneumatic system. Dekoron products cost less to buy . . . less to install . . . last longer. *So tube up with Dekoron products —and watch your costs come tumbling down.*

Dekoron® products

QUALITY • RESEARCH • SERVICE
SAMUEL MOORE & COMPANY
DEKORON PRODUCTS DIVISION • MANTUA, OHIO

FITTINGS AND ACCESSORIES
The Dekoron line includes a complete line of fittings for joining lengths of tubing, junction boxes and entry grommets, and Dekoron tubing racks.

AA-1618

For more information circle **41** on inquiry card.

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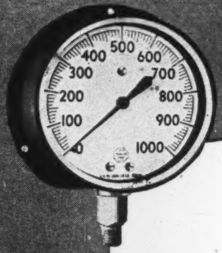
American Chain & Cable Company, Inc.

929-M Connecticut Avenue
Bridgeport 2, Connecticut

HELICOID GAGES.....No gears, No teeth



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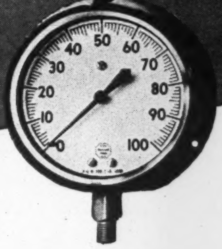
ACALOY
Flanged Case



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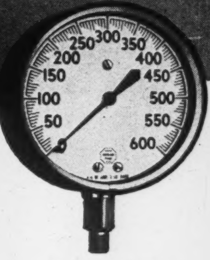
PHENOL
Turret Case



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ACALOY
Flangeless Case

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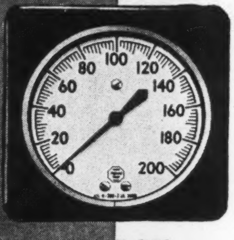
ACALOY
Flush Case



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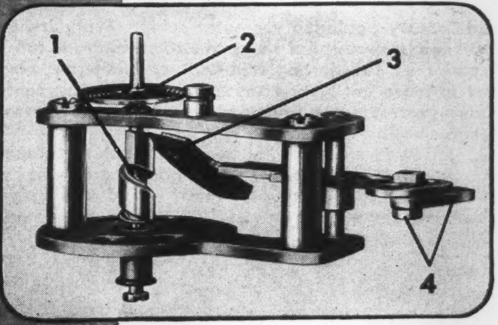
200

ACALOY
Square Flush Case

The greatest achievement of the gage makers' craft — pressure gages without gears, without teeth, thus eliminating major sources of gage trouble such as wearing and fouling of teeth and excessive play between teeth in geared movements. No expense has been spared in extensive research, engineering and testing equipment to produce this pressure instrument of utmost precision and enduring accuracy.

HELICOID GAGES are available for practically every type of installation and service — in many sizes and many styles — for pressure, vacuum, or compound service. Furnished in a full range of pressures; all with the Helicoid stainless movement.



FOUR HELICOID FEATURES

1. Stainless Steel Helicoid Roller (no gear teeth)
2. Stainless Steel Hair Spring
3. Long Life Cam (no gear teeth)
4. Corrosion-resistant Link and Screws

WRITE TODAY for the Helicoid Gage Catalog

ACCO

HELICOID GAGE DIVISION
AMERICAN CHAIN & CABLE

HELICOID
Pressure
•
Vacuum
GAGES

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Here's Mid-Century's Analogue Computer Installation

AT **REPUBLIC AVIATION**

Where huge savings in time and costs will be realized!

Because Republic can "fly" an aircraft or guided missile, including take-off, cruise, landing, maneuvers and emergency conditions right in this computer center. Here, the actual performance is actually and accurately simulated, in a safe and in a relatively inexpensive manner. Here the optimum in design characteristics is determined without endangering human lives or incurring losses of millions of dollars with test flight models.

Every industry that now utilizes test models can save millions of dollars in time and model costs with a Mid-Century analogue computer center. Every industry that needs production or automation controls can do likewise by substituting Mid-Century analogue computers to more easily and cheaply adjust their manufacturing processes to a higher optimum of production with greater uniform quality.

For a Free Survey on how Mid-Century computer equipment can help solve your specific problems, you need only mail the coupon today — and add to your earnings tomorrow!

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For more information circle **43** on inquiry card.

The first and much-needed book on small research reactors

Nuclear Reactors for Industry and Universities

written by eight eminent authorities and edited by Ernest H. Wakefield

CONTENTS

Chapter I.	Nuclear Reactor Types
Chapter II.	Availability and Selection
Chapter III.	Radioactivity Measurement
Chapter IV.	Radiation Protection
Chapter V.	Reactor Control
Chapter VI.	Instruments for Experiments
Chapter VII.	Cost Study
Chapter VIII.	Legal Aspects

APPENDIX—Glossary of Terminology, Cloth, 102 pages, photos and diagrams, 4-page index.

$2.00 postpaid

Remittance must accompany order

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Pittsburgh 12, Pennsylvania

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Name ....
Address ....
City ....

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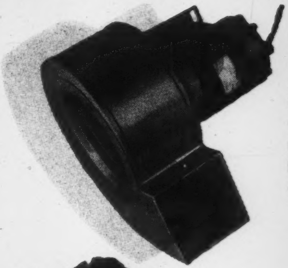
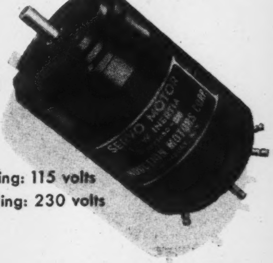
FBC 2922 B-2
250 cfm @ .5" sp
115 volts
60 cycle
Single phase
Weight: 8 lbs.



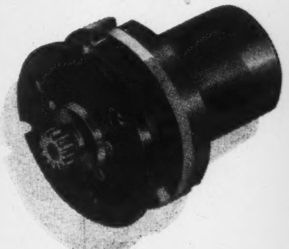
2900 FRAME—IMC's 2900 frame series is available either as non-synchronous or synchronous (reluctance or hysteresis types) in horsepowers from 1/200 to 1/8, voltages from 26-208. Units suited for use in recording instrumentation, where low noise levels and speed uniformity are critical.

BT 1708 G-1
Two phase
(Impedance 9000 ohms)
60 cycle
Two pole
3300 free rpm
Voltage-Reference winding: 115 volts
Voltage-Controlled winding: 230 volts
Weight: 1 lb.



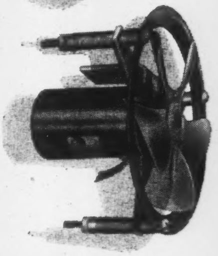
1700 FRAME—Servo motors can be obtained in either one or two phases, 60-400 cycles, 2, 4, 6 or 8-pole construction. All are built to meet military specifications on humidity, high ambient temperatures, vibration or altitude. Units are available with high impedance controlled winding. Shaft diameter, length optional.

BD 1206 G
Torque-60 oz. in.
200 rpm
28 volts DC
Weight: 7 oz.



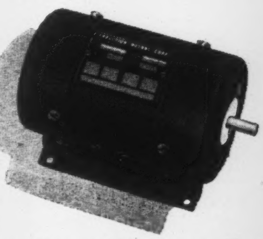
1200 FRAME—Miniature, permanent-magnet DC motors in horsepowers from 1/300 to 1/75, are well-suited for blower, fan and gear motor applications in both military and commercial flight installations. These high-power units are available in voltages from 6-28. All are 2-pole, ball-bearing devices.

BC 1615 F-23
90 NAFM rating
115 volts
60 cycle
Single phase
Weight: 1 lb. 8 oz.



1600 FRAME—This series is comprised of induction type, non-synchronous or synchronous units with low temperature rise, in horsepower range from 1/300 to 1/10, voltages from 26-208. All have anodized aluminum housings; either ball or sleeve bearing construction and can withstand ambient temperatures up to 150°C.

3011 DYNAMOTOR
Input: 27.5 v at 3 amps
Output: 160 v at 250 ma
Speed: 9000 rpm



3000 FRAME—Newest additions to the Induction line are the 3000 frame series dynamotors. These units, which feature power output up to 110 w depending on duty cycle and ventilation, operate in the temperature range from minus 55—plus 105°C. Precise input and output voltages are available to meet your specifications in this and other dynamotor frame sizes.

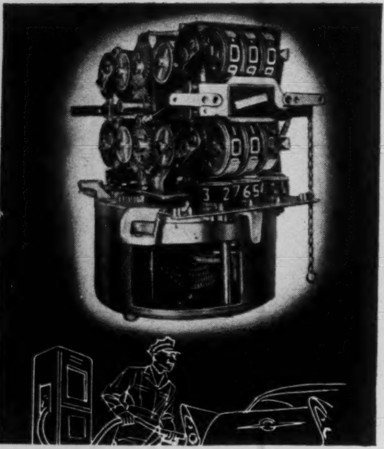
Other motor, gear, fan and blower applications listed in the IMC catalog

IMC

Induction Motors Corp.

570 Main St., Westbury, L. I., N. Y. Phone EDgewood 4-7070

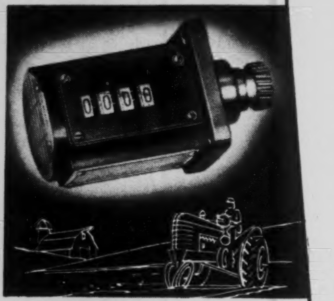
For more information circle 44 on inquiry card.


Computing Head for Gasoline Pumps

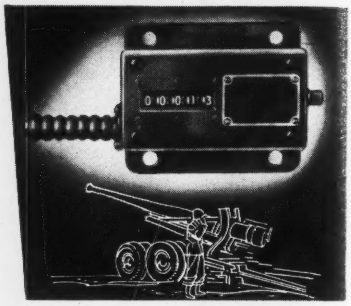
"Master Meter Duplicator" prints receipts for fuel oil delivered from trucks

0 2 5 0
GALLONS

"Vary-Tally" Multi-Unit Reset Manual Counter


Rev-Counter for all types of engines

Everyone Can Count on VEEDER-ROOT


Recoil Counter for new 280 mm atomic cannon

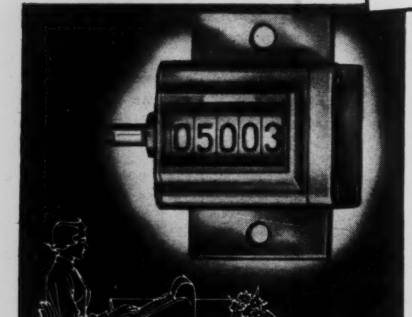
2-3-4 Convertible Counters (and others) for textile machinery

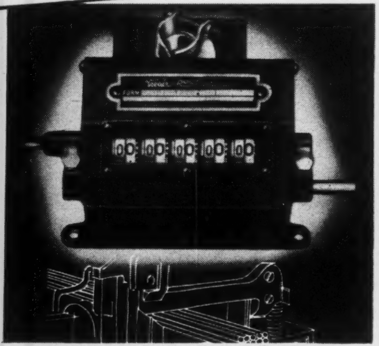
Everywhere you look in everyday life, you see a familiar face . . . the face of a Veeder-Root Counter or Computer. From gasoline pumps to fuel oil trucks to textile mills . . . in the home, on the farm, in business and commerce, in modern automated industry . . . Veeder-Root standard and special devices are keeping everything under *Count*rol . . . manually, mechanically, electrically. And the mathematical probabilities are mighty high that *you* can count on Veeder-Root, too . . . to your advantage and profit. Why not let us figure out how, *right now?*

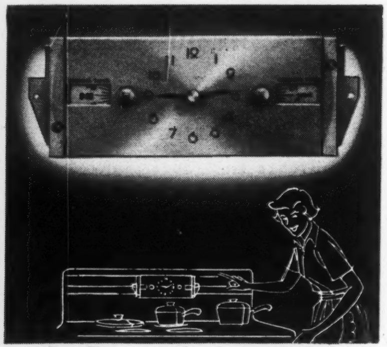
VEEDER-ROOT INC. • HARTFORD 2, CONN.

Fuel-Remaining Counter for aircraft . . . subtracts as fuel is used

FUEL REMAINING
0 0 0 1
GALLONS

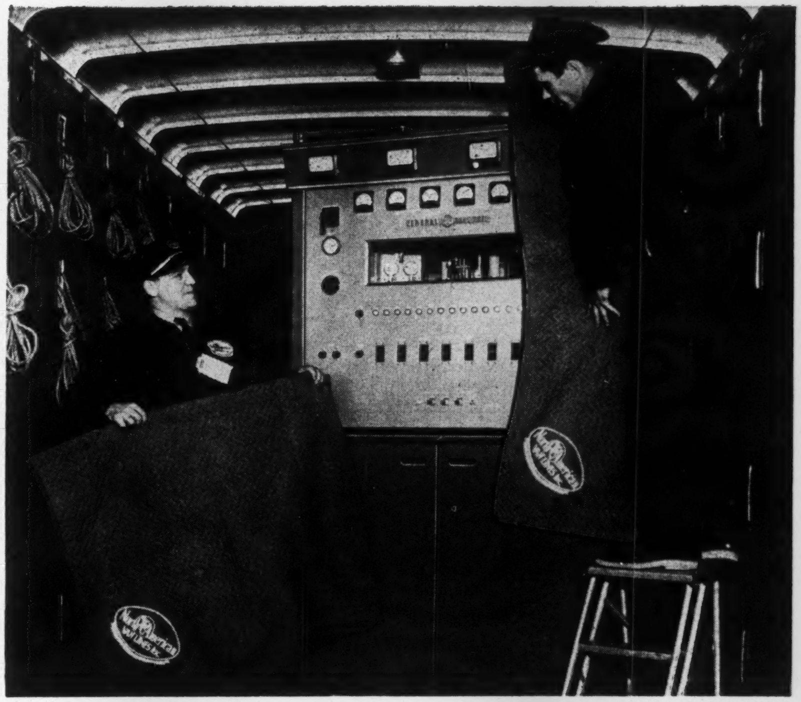

Small Square-Case Counters for office and other machines


Predetermining Counters for preventing short and over-runs on production machines


Range Timer . . . easy to read . . . easy to set

***STOCKS OF STANDARD COUNTERS AVAILABLE AT* — Greenville, S. C. • Chicago 6, Ill. • New York 19, N. Y. • Los Angeles • San Francisco**
Montreal 2, Canada • Offices and Agents in Other Principal Cities

For more information circle **45** on inquiry card.



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High-Value Products
gentled just like
NORTH AMERICAN
"Wife-Approved" Moves!

Delicate laboratory equipment, electronic devices, business machines and other precision products are now being shipped safely and economically by North American padded van!

They get the same safe, professional coddling we give a family's household treasures in our famous "*Wife-Approved*" moving service. You need no crates; no disassembling for shipment and reassembling on site. Think of the savings!

NAVL "FOLLOW-THRU" SERVICE

Our specialized department can "*follow-thru*" on any shipment anywhere, since we have over 1100 agents in U. S. and Canada, more by far than any other van line. Call your local NAVL agent for details or send for name of nearest agent.

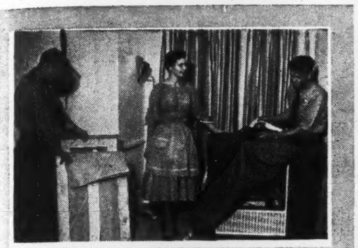
"WIFE-APPROVED" MOVES

North American VAN LINES, Inc.

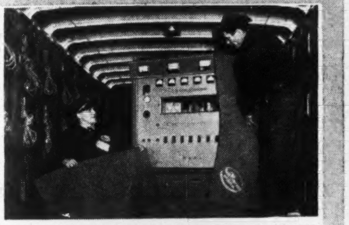
WORLD-WIDE MOVING

NORTH AMERICAN VAN LINES, INC.
World Headquarters: Fort Wayne 1, Indiana
North American Van Lines Canada, Ltd. • Toronto

INDUSTRIAL MOVING SERVICES: Quick, safe handling of Company-Paid Personnel Moves; Exhibit Displays; High-Value Products; New Furniture; Office Equipment. See your NAVL Agent.



Careful, on-time household moves—a North American specialty!



Sensitive, high-value products can travel without dismantling, via NAVL.

NAVL (Creston Division) is best way to ship uncrated new furnishings.

Move exhibit displays safest and quickest in NAVL padded vans.

By sea or air "anywhere"—that's North American World-Wide Service!

EXCELLENT OPPORTUNITY FOR LOCAL MOVERS

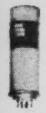
A few choice areas open for firms that can qualify as North American Agents. Many sources of extra business. Complete sales help. Write for information.

WORLD-WIDE MOVING: LAND, SEA, AIR

For more information circle **46** on inquiry card.

FREQUENCY STANDARDS

PRECISION FORK UNIT
TYPE 50

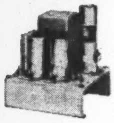


Size 1" dia. x 3¾" H. Wght., 4 oz.*

Frequencies: 240 to 1000 cycles
Accuracies:—
Type 50 (±.02% at —65° to 85°C)
Type R50 (±.002% at 15° to 35°C)
Double triode and 5 pigtail parts required
Input, Tube heater voltage and B voltage
Output, approx. 5V into 200,000 ohms

*3⅛" high
400 - 1000 cy.

FREQUENCY STANDARD
TYPE 50L



Size 3¾" x 4½" x 5½" High
Weight, 2 lbs.

Frequencies: 50, 60, 75 or 100 cycles
Accuracies:—
Type 50L (±.02% at —65° to 85°C)
Type R50L (±.002% at 15° to 35°C)
Output, 3V into 200,000 ohms
Input, 150 to 300V, B (6V at .6 amps.)

PRECISION FORK UNIT
TYPE 2003

Size 1½" dia. x 4½" H. Wght. 8 oz.*

Frequencies: 200 to 4000 cycles
Accuracies:—
Type 2003 (±.02% at —65° to 85°C)
Type R2003 (±.002% at 15° to 35°C)
Type W2003 (±.005% at —65° to 85°C)
Double triode and 5 pigtail parts required
Input and output same as Type 50, above

*3½" high
400 to 500 cy.
optional

FREQUENCY STANDARD
TYPE 2005

Size, 8" x 8" x 7¼" High
Weight, 14 lbs.

Frequencies: 50 to 400 cycles (Specify)
Accuracy: ±.001% from 20° to 30°C
Output, 10 Watts at 115 Volts
Input, 115V. (50 to 400 cycles)

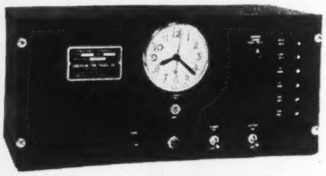
FREQUENCY STANDARD
TYPE 2007T
TRANSISTORIZED

Size 1½" dia. x 4½" H. Wght. 7 ozs.*

Frequencies: 240 to 1000 cycles
Accuracies:—Same as 2003, above
Type 2007S—Silicon type
Input, 28V.
Output, Multitap, 75 to 100,000 ohms

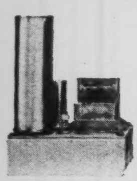
*3½" in 2007S, 400 to 800 cycles.

FREQUENCY STANDARD
TYPE 2121A



Size
8¾" x 19" panel
Weight, 25 lbs.
Output: 115V
60 cycles, 10 Watt
Accuracy:
±.001% from 20° to 30°C
Input, 115V (50 to 400 cycles)

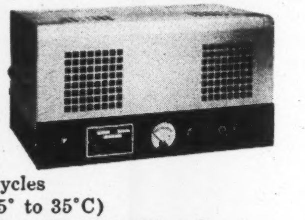
FREQUENCY STANDARD
TYPE 2001-2



Size 3¾" x 4½" x 6" H., Wght. 26 oz.

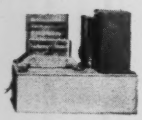
Frequencies: 200 to 3000 cycles
Accuracy: ±.001% at 20° to 30°C
Output: 5V. at 250,000 ohms
Input: Heater voltage, 6.3 - 12 - 28
B voltage, 100 to 300 V., at 5 to 10 ma.

FREQUENCY STANDARD
TYPE 2111C



Size, with cover
10" x 17" x 9" H.
Panel model
10" x 19" x 8¾" H.
Weight, 25 lbs.
Frequencies: 50 to 1000 cycles
Accuracy: (±.002% at 15° to 35°C)
Output: 115V, 75W. Input: 115V, 50 to 75 cycles.

ACCESSORY UNITS
for TYPE 2001-2



L—For low frequencies multi-vibrator type, 40-200 cy.
D—For low frequencies counter type, 40-200 cy.
H—For high freqs, up to 20 KC.
M—Power Amplifier, 2W output.
P—Power supply.

This organization makes frequency standards within a range of 30 to 30,000 cycles. They are used extensively by aviation, industry, government departments, armed forces—where maximum accuracy and durability are required.

WHEN REQUESTING INFORMATION
PLEASE SPECIFY TYPE NUMBER

American Time Products, Inc.

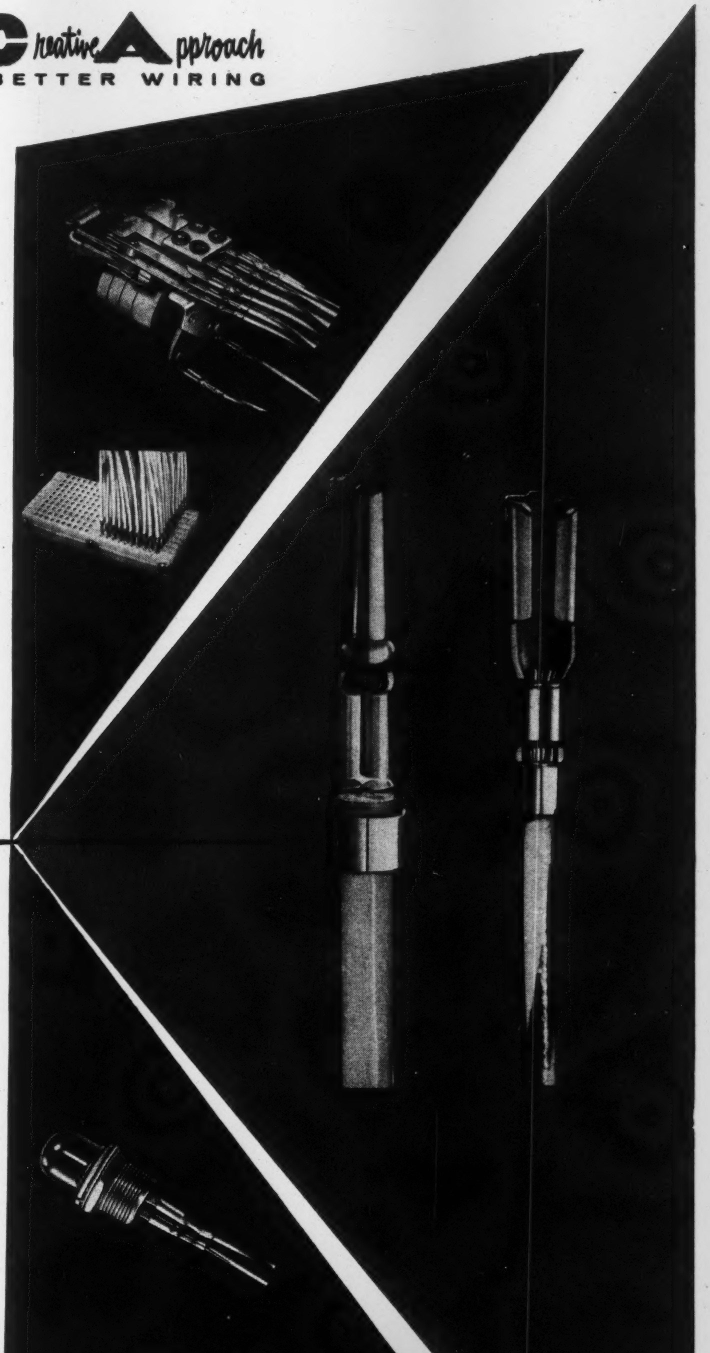
580 FIFTH AVENUE, NEW YORK 36, N. Y.

For more information circle **47** on inquiry card.

ask about Amp's Creative Approach
TO BETTER WIRING

More Confidence... Less Expense with A-MP

Taper Technique



A-MP Taper Pins, Taper Bloks, Taper Tips, Taper Tabs and Taper Tab Receptacles offer great freedom of circuit design and insure maximum electrical stability.

They cut material cost . . . cut labor cost . . . and reduce assembly time. Taper Technique is benefiting manufacturers of business machines, aircraft, guided missiles and electronic equipment.

You, too, can benefit by the A-MP Taper Technique. Consult your local A-MP salesman or write to Harrisburg.

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General Office: Harrisburg, Pa.

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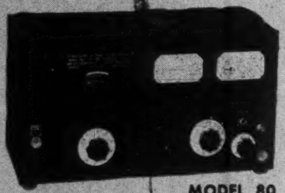
Aircraft-Marine Products (G.B.) Ltd., London, England • Societe A-MP de France, Courbevoie, Seine, France

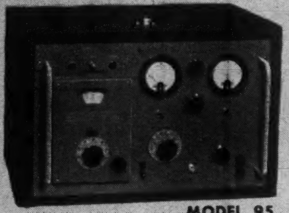
For more information circle **48** on inquiry card.

MEASUREMENTS CORPORATION

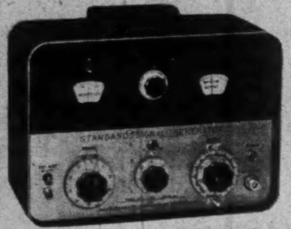
Laboratory Standards



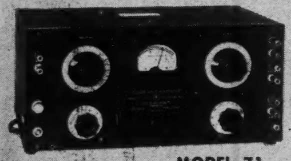
MODEL 80
STANDARD SIGNAL GENERATOR



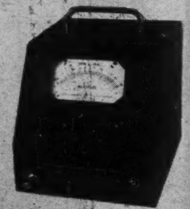
MODEL 95
STANDARD SIGNAL GENERATOR



MODEL 210-A
FM STANDARD SIGNAL GENERATOR



MODEL 71
SQUARE WAVE GENERATOR



MODEL 67
PEAK-TO-PEAK VOLTMETER

STANDARD SIGNAL GENERATORS

MODEL	FREQUENCY RANGE
65-B	75 Kc to 30 Mc
80	2 Mc to 400 Mc
80-R	5 Mc to 475 Mc
82	20 Cycles to 200 Kc 80 Kc to 50 Mc
84-R	300 Mc to 1000 Mc
84-TVR	400 Mc to 1000 Mc
95	50 Mc to 400 Mc
210-A	86 Mc to 108 Mc

SQUARE WAVE GENERATOR

MODEL	FREQUENCY RANGE
71	6 to 100,000 Cycles Continuously variable

PULSE GENERATOR

MODEL	FREQUENCY RANGE
79-B	60 to 100,000 pulses per second

VHF FIELD STRENGTH METER

MODEL	FREQUENCY RANGE
58-AS	15 Mc to 150 Mc

HIGH FREQUENCY BARRETTER

MODEL	FREQUENCY RANGE
202-C	2 Mc to 1000 Mc

VACUUM TUBE VOLTMETERS

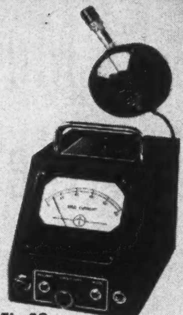
MODEL	FREQUENCY RANGE
62	30 cps to over 150 Mc
67	5 to 100,000 sine-wave cps.

MEGACYCLE "GRID-DIP" METERS

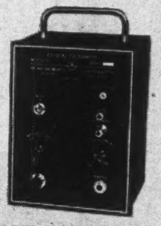
MODEL	FREQUENCY RANGE
59 LF	0.1 Mc to 4.5 Mc
59	2.2 Mc to 420 Mc
59 UHF	420 Mc to 940 Mc

CRYSTAL CALIBRATORS

MODEL	FREQUENCY RANGE
111	250 Kc to 1000 Mc
111-B	100 Kc to 1000 Mc

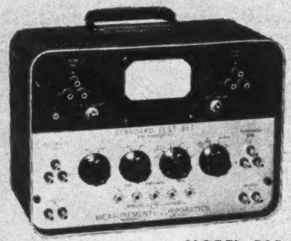


MODEL 59
MEGACYCLE "GRID-DIP" METER



MODEL 111
CRYSTAL CALIBRATOR

STANDARD TEST SET for TRANSISTORS



MODEL 505

Tests PNP and NPN small-signal, medium-power and switching transistors.

Checks for short-circuited emitter-collector junctions.

Measures collector-to-emitter leakage current.

Measures collector current and d-c gain.

Case Dimensions: 10" high x 14" wide x 7¼" deep.

Power Supply: Two F4BP 6-volt dry batteries.

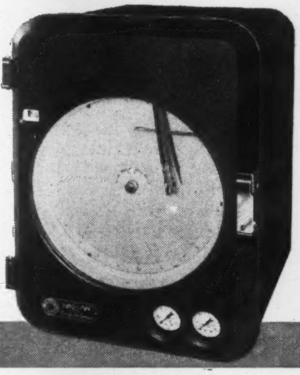
Weight: Approximately 9 pounds without batteries.

MEASUREMENTS CORPORATION

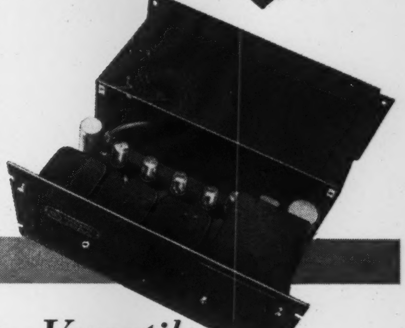
BOONTON • NEW JERSEY

For more information circle **49** on inquiry card.

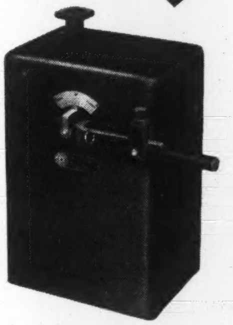
Hagan Ring Balance—Versatile and accurate flow meters for gas or liquids.



PowrAmp Model "P"—high accuracy (±¼% of input range) high speed (full scale in 0.1 second) D.C. Amplifier is a versatile instrument for temperature measurement and control.



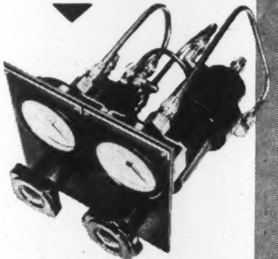
Precision positioning power cylinders in full range of sizes.



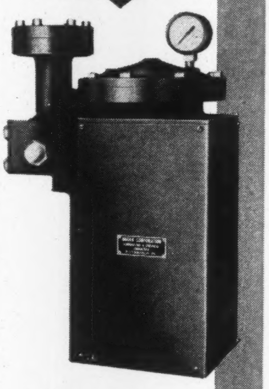
Accurate—Dependable—Versatile *INSTRUMENTATION and CONTROL*

by HAGAN

Relays—permit remote manual operation and adjustment of systems.



Hagan Flow signal transmitter, high and low pressure, produce accurate signals linear with flow.



Hagan offers the most complete line of integrated control and instrumentation components available. The many Hagan devices may be grouped in the following categories:

SENSING AND MEASURING ELEMENTS

Transducers: pneumatic, electro-pneumatic and electronic for all process variables such as temperature, pressure, flow or electrical quantities. Also, pneumatic load cells and electronic pressure transducers.

Recording and integrating meters and controllers for all process variables. Computing flow meters automatically correcting for variations in pressure, temperature or density, available for static pressures up to 15,000 psig. Also line insertion oil meters and totalizing meter systems.

REGULATORS, RELAYS, COMPUTERS

Pneumatic, hydraulic, electro-pneumatic and electro-hydraulic regulators and computers for industrial processes and high performance servo systems. Automatic gain controllers. Pneumatic Relays, ranging from the simplest compensating type to multi-input computing relays. Complete control panels.

POWER UNITS

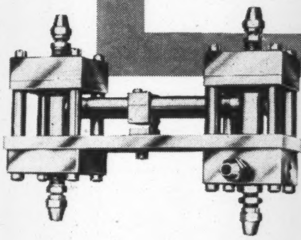
A full range of power units include: diaphragm motor, precision positioning type double-acting pneumatic cylinders with from 4″ to 12″ bore and 5″ to 48″ stroke. Hydraulic and electro-hydraulic servo cylinder positioners for pressures to 2,000 psig, hydraulic capacity to 500 gpm.

SPECIALTY VALVES

V-port butterfly gas valves to 14″. Fuel oil control valves.

A phone call or letter to the nearest Hagan office will bring you complete information on these or any one of the many other Hagan units. Call on the Hagan engineer for assistance on your control and instrumentation problems.

Hagan Ratio Totalizer—adds, subtracts, multiplies, divides, or proportions two or more signals. May also be used as a controller.



HAGAN CORPORATION
HAGAN BUILDING, PITTSBURGH 30, PA.

HAGAN

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For more information circle **50** on inquiry card.

FROM MILLIWATTS TO KILOWATTS

HIGH VOLTAGE POWER SUPPLIES AND EQUIPMENT

We have sold quantities of these power supplies to laboratories, industrial concerns, the government and universities. Only the best available selected material goes into these units, so that you will have many years of dependable service. Only a few of our standard models are shown below. Quotations on special supplies cheerfully given.

PRECISE MEASUREMENTS COMPANY

R. D. #1, MillBrook Road, Route 202, One Mile East of Flemington, New Jersey—Phone: Flemington 938 R 22

HIGH VOLTAGE POWER SUPPLIES

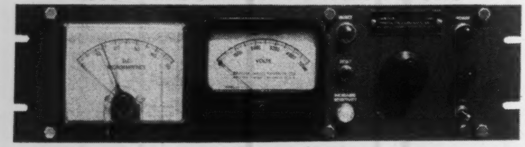
One of the most popular power supplies on the market. Completely redesigned for greater ruggedness and convenience of operation. Widely used for powering electronic equipment and for routine breakdown and insulation testing. Output voltage is well filtered D.C. which is adjustable with convenient front panel control. Input is 115 Volt, 60 cycle A.C. Equipment is available without meter, with one meter (4½"), with two meters or with larger 6" precision 1% mirror scale movement. Regulated models offer closely stabilized output voltage regardless of line or load changes.

Model	Maximum Voltage	Price	Price Regulated Model
6000-1 With Kilovolt Meter	1,000	$75.00	
6000	2,500	60.00	
6000-A With Kilovolt Meter	2,500	80.00	**120.00**
6005	5,000	75.00	
6005-A With Kilovolt Meter	5,000	95.00	**135.00**
6010	10,000	85.00	
6010-A With Kilovolt Meter	10,000	105.00	**145.00**
6015	15,000	95.00	
6015-A With Kilovolt Meter	15,000	115.00	**155.00**
6025	25,000	115.00	
6025-A With Kilovolt Meter	25,000	155.00	**205.00**

For additional built in current meter (both meters are 3 inch size), including automatic meter protector circuit, add $35.00 to any power supply.

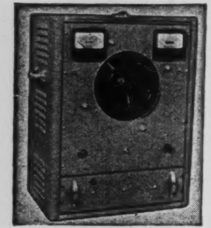
For 6 inch precision 1% mirror scale kilovoltmeter, add $35.00 to any kilovoltmeter equipped power supply price.

RACK MOUNTED POWER PACKS



Any power supply we manufacture can be obtained with this type of mounting. Exact price depends upon type of power supply.

INDUSTRIAL POWER SUPPLIES



Regulated Types Available

Standard hum level 5% or less. .01% to 1% ripple available. All power supplies have automatic overload cutout control circuits. Regulated models available. They stabilize by means of a rugged saturable reactor control system.

These industrial type power supplies are built for service and efficiency. All are of the transformer type and employ husky components that have been selected for their power handling capacity. Controls are arranged so that operation is greatly simplified and a number of safety features are built in for maximum protection of personnel and equipment. Output is continuously variable from zero to full rated value. Polarity reversing models (as illustrated) can be had at additional cost.

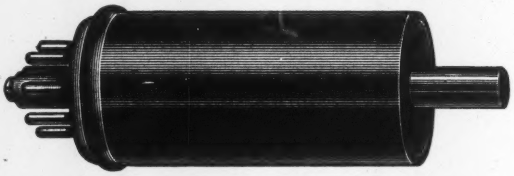
Model	Voltage	Current	Price
F-6001	0-1000	2 Amp	**$975.00**
F-6002	0-2000	1 Amp	**985.00**
F-6005-A1-H	0-5000	100 MA	**550.00**
F-6005-A1-5H	0-5000	500 MA	**650.00**
F-6005-A1-1K	0-5000	1 Amp	**1100.00**
F-6010-A1	0-10,000	100 MA	**800.00**
F-6020-A05	0-20,000	50 MA	**975.00**
F-6050-T	0-50,000	½ MA	**600.00**
F-6100-T	0-100,000	½ MA	**1100.00**

AC INSULATION AND BREAKDOWN TESTERS

Used in testing insulation where AC voltages are desired. Dual instruments are also available which provide choice of AC or DC output with simple toggle switch selection. Units include kilovoltmeter, current meter and automatic over-load cutout circuits.

Model	Voltage	VA	AC	Price AC and DC
3000	0 to 3,000	75	$150.00	**$ 250.00**
3010	0 to 3,000	300	250.00	**400.00**
3050	0 to 3,000	1,500	500.00	**650.00**
3100	0 to 6,000	3,000	700.00	**1,100.00**

HIGH VOLTAGE CONVERTERS



TRANSISTOR AND VIBRATOR TYPES now available from stock. Simply connect input to battery and obtain your high voltage output. Replaces expensive and bulky high voltage batteries. Output is AC in most cases and may be easily rectified with a tube or selenium stack. Also available with DC output (contains built-in rectifier and filter circuit). Other models with higher or lower voltages can be made for your specific requirements. 500 Volt units may be used with a voltage doubler circuit for 1000 Volts output.

Model	Type	DC Input	AC Output	Maximum Output Power	Price
01-50	TRANSISTOR	2 to 12 V	0 to 50 V	50 MW	**$12.00**
3-50	TRANSISTOR	2 to 12 V	0 to 50 V	3 Watts	**25.00**
01-500	TRANSISTOR	2 to 12 V	0 to 500 V	50 MW	**15.00**
3-500	TRANSISTOR	2 to 12 V	0 to 500 V	3 Watts	**35.00**
7 MVT	VIBRATOR	1 to 4 V	0 to 6,000 V	.1 Watt	**12.50**
10 MVT	" (not cased)	1 to 4 V	0 to 6,000 V	.1 Watt	**10.00**

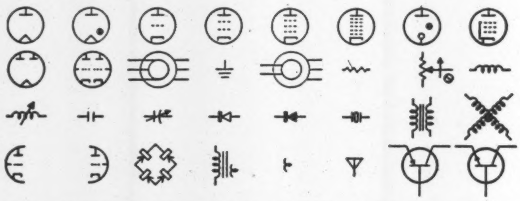
TRANSFORMERS, HIGH VOLTAGE

For those who build their own power supplies. These units are small and compact and rated for constant service. Primary designed for 115 Volts 60 Cycle. A filament tap on the high end of the secondary eliminates the need for separate filament transformers in many applications. Only standard models are listed, other voltages and currents available on order.

Model	Voltage	Current	Filament	Construction
1 KVT	1 KV	1 MA	1¼ V @ ¼ amp	Open Frame
2 KVT	2 KV	1 MA	1¼ V @ ¼ amp	Open Frame
3 KVT	3 KV	1 MA	1¼ V @ ¼ amp	Open Frame
5 KVT	5 KV	1 MA	1¼ V @ ¼ amp	Open Frame
10 KVT	10 KV	1 MA	5 V @ 5 amp	Oil Filled
15 KVT	15 KV	1 MA	5 V @ 5 amp	Oil Filled
25 KVT	25 KV	1 MA	5 V @ 5 amp	Oil Filled

TRANSPARENT SYMBOL STAMPS

SAVE HOURS OF DRAFTING TIME. Works like a rubber stamp. Simply ink, sight through "cross hairs" and make your impression.



GOVERNMENT SERIES SET. Widely used by both government and industry. Consists of 32 selected symbols as shown. All are strictly in accordance with standard specifications. **Price $25.00** .... Set of 32 Symbols

METAL ELEMENT STAMP PAD

Made of porous bronze. Gives a more uniform impression every time. Use it with any kind of stamp. Ink never dries out in pad, yet dries instantly on most paper surfaces (not intended for highly glazed surfaces). Available in red or black. Price only $2.50 each. Ink refill cartridge 50c.

For more information circle **51** on inquiry card.

FINE SCREWS

for

INSTRUMENT and FINE MACHINE WORK

National Fine Series
National Course Series
Metric S. I. & D. I. N. Series

All sizes #00 to #10 in regular stock

Accurate Milled Threads, Perfectly formed and finished heads, sharp edges and points.

BRASS—STEEL—Other Metals

Also

Finished Washers, Hexagon
Nuts—Tops—Drills
Dies—Counterbores
for all Metric and U. S. Sizes

Precision Cut Thread Wood Screws

Brass & Steel
for Cameras, Meter Cases, etc.

Spirec and Pivoted Drills

.0016" dia. and larger.

Catalog on request

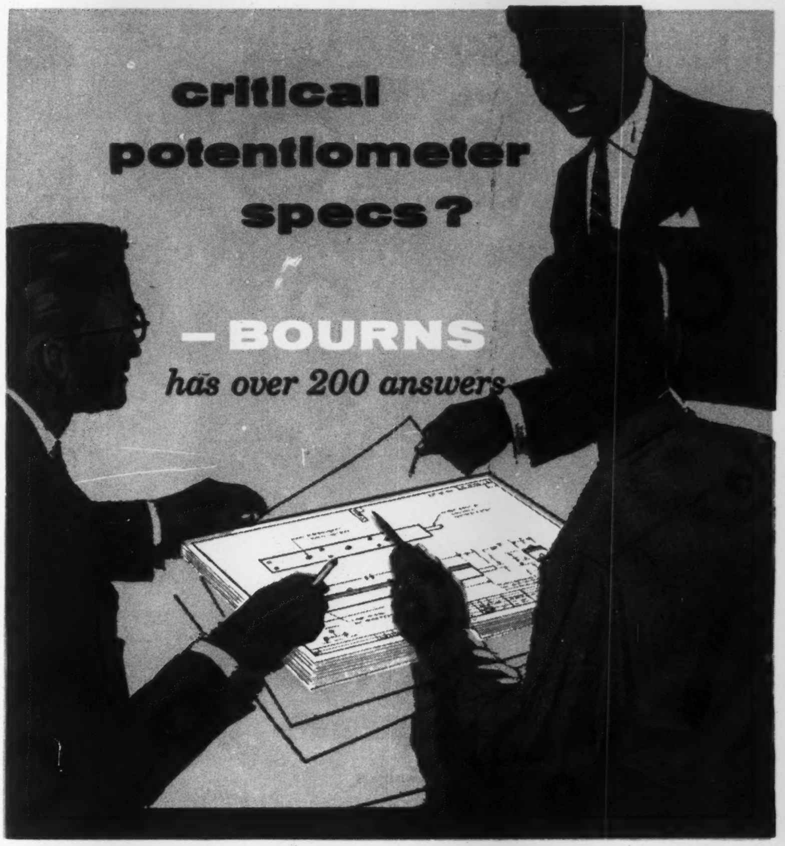
THE

R. Y. FERNER CO.

INCORPORATED

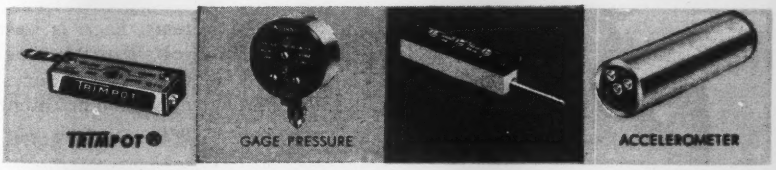
110 Pleasant St. Malden, Mass.

For more information circle **52** on inquiry card.



To fit numerous applications, Bourns has 200 designs of miniaturized, high-performance sensing instruments on file. These designs are either standard types, or variations made to meet critical electrical and environmental specifications. The pressure potentiometer designs range from ½ to 10,000 p. s. i. Linear motion units provide travels of ⅛" to 30", and you can choose from a wide variety of resistance ranges.

The instrument you need may be among these Bourns designs—ready for production from parts in stock. Or one of the designs now on our boards may meet your specs. If not, we will gladly consider developing the instrument you require. Send us your specifications—your problem may already be solved.

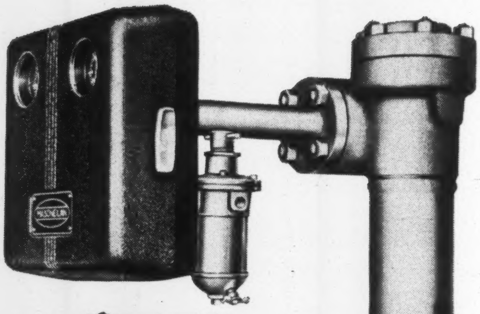


BOURNS LABORATORIES

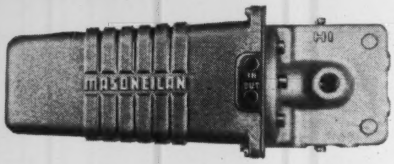
6135 Magnolia Avenue, Riverside, California
Technical Bulletins on Request, Dept. 22

For more information circle **53** on inquiry card.

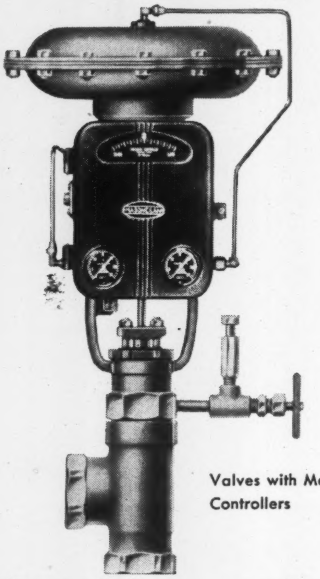
Indicating, Recording and Non-indicating Controllers



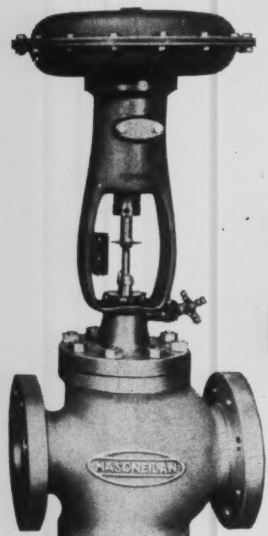
Liquid Level Controllers



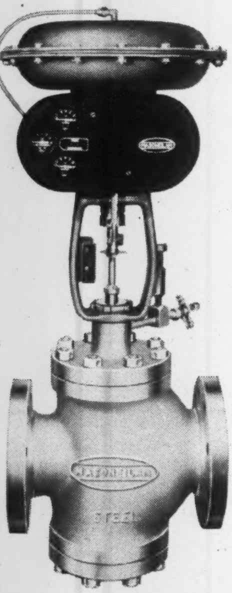
Differential Pressure Transmitters



Valves with Mounted Pressure Controllers



Wide Variety of Control Valves



Valve Positioners

Mason-Neilan

Serves the Process Industries with Accurate and Reliable Control Equipment

Since 1882 Mason-Neilan has supplied industry with a wide variety of standard and specialized automatic control equipment for process and associated services. Each is a development of practical engineering based on experience gained in close contact with industrial control problems. Each is specifically designed to do an exceptional job. With Masoneilan products you get engineered equipment that assures superior performance, long life with minimum maintenance.

When writing for information please specify item or items which interest you.

Industrial Control MASONEILAN *Specialists Since 1882*

MASON-NEILAN
Division of Worthington Corporation
55 NAHATAN STREET, NORWOOD, MASS.

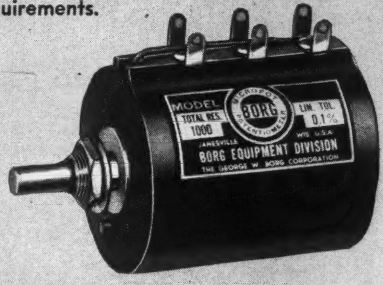
For more information circle **54** on inquiry card.

PRECISION IS OUR BUSINESS

900 SERIES
BORG
MICROPOT POTENTIOMETER
JANESVILLE
WIS. U.S.A.

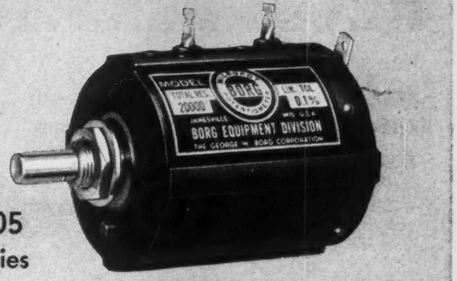
900 series

The new standard of high-precision potentiometers. Advantages include greater accuracy, finer resolution, lower torque, longer life and better performance under adverse environmental conditions. 48 standard models meet most special design requirements.


MODEL
TOTAL RES.
1000
BORG
MICROPOT POTENTIOMETER
LIN. TOL.
0.1%
JANESVILLE
WIS. U.S.A.
BORG EQUIPMENT DIVISION
THE GEORGE W. BORG CORPORATION

1100 series

Precision potentiometers that offer your products a price advantage in today's competitive markets. Engineered for easy installation with readily accessible terminals. Accurate, dependable, long lived.


MODEL
TOTAL RES.
20000
BORG
MICROPOT POTENTIOMETER
LIN. TOL.
0.1%
JANESVILLE
WIS. U.S.A.
BORG EQUIPMENT DIVISION
THE GEORGE W. BORG CORPORATION

205 series

Long a favorite for both military and commercial purposes. Has proved itself exceptionally rugged and dependable in years of use on many mobile and stationary applications.

BORG MICROPOTS

precision potentiometers with

UNLIMITED DESIGN APPLICATIONS...
MORE PROFITABLE PRODUCTION POSSIBILITIES

Your job is made easier when you use Borg Micropots. They're versatile . . . they're flexible. Standard models can be readily adapted to meet the special requirements of a wide variety of applications. What is more they have many exclusive advantages: —— absolute linearity, permanent accuracy, long life, and dependability. You can rely on them to meet your most rigid commercial and/or military specifications. They're readily available too. Production has been stepped up to assure prompt delivery of any model in any quantity. We invite consultation with your Borg "Tech-Rep". His helpful advice can often save you time and money. Write us today for his name and address. It will pay you to know him.

BORG EQUIPMENT DIVISION
The George W. Borg Corporation
Janesville, Wisconsin

ELECTRONIC — MECHANICAL BORG EQUIPMENT

Built by Borg

For more information circle **55** on inquiry card.

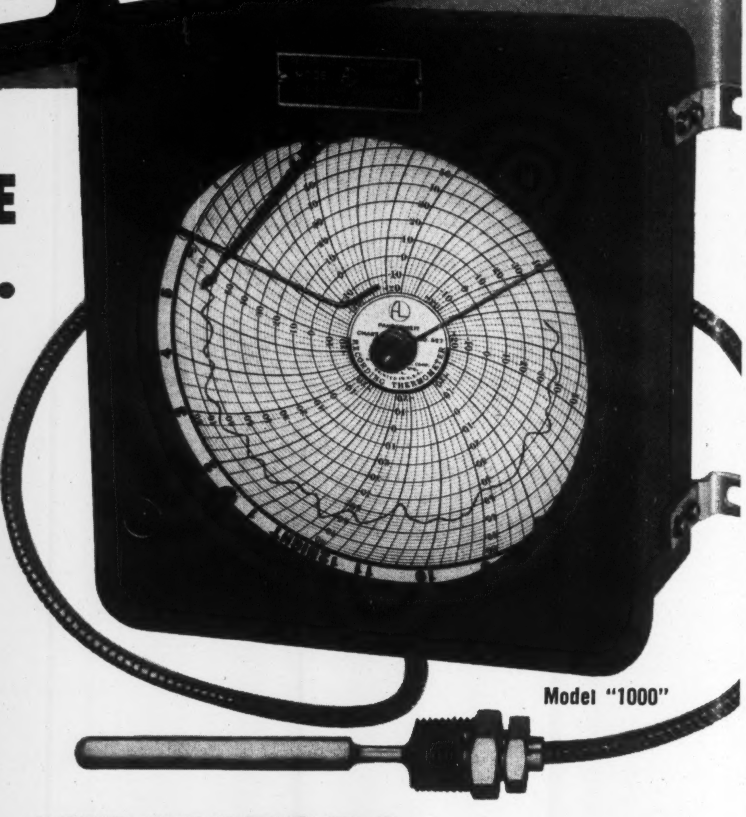
AUTO-LITE

SEE THE
AUTO-LITE EXHIBIT
AUTOMATION EXPOSITION
NOV. 26-30
BOOTH 322

TEMPERATURE RECORDERS...

Newly designed, Model "1000" Auto-Lite Recorder gives permanent proof of temperature behavior.

- 6″ clear reading chart; various standard ranges from minus 40°F. to plus 550°F.
- 3 standard types; choice of 24-hr. or 7-day cycle.
- Electric or mechanical chart drive.
- With capillary tubing for remote reading. Priced from $49.50



Model "1000"

TEMPERATURE INDICATORS...

20
40
60
80
100
120
140
160
180
200
220

Auto-Lite offers many thermometer styles, permitting plant-wide temperature observation at low cost. Standard temperature ranges from minus 60°F. to plus 750°F. Send for latest catalog showing various types of Auto-Lite Indicators and Recorders.

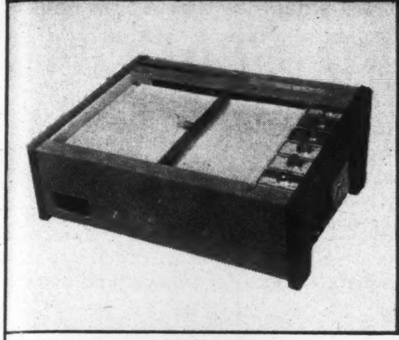
Model F-1 temperature indicator — Rigid stem or capillary tubing for EYE-LEVEL remote reading. Priced from **$23.50**

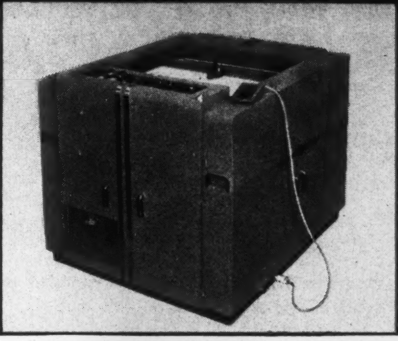
THE ELECTRIC AUTO-LITE COMPANY
INDUSTRIAL THERMOMETER DIVISION
TOLEDO 1, OHIO
NEW YORK • CHICAGO • SARNIA, ONTARIO

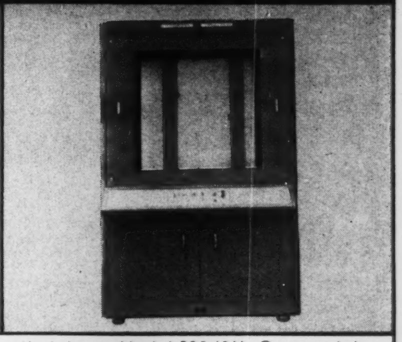
AUTO-LITE MEANS PRECISION MANUFACTURING

For more information circle **56** on inquiry card.

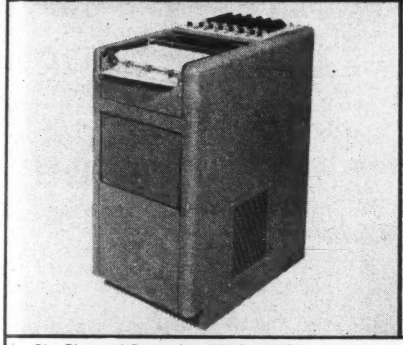
TRUST PACE

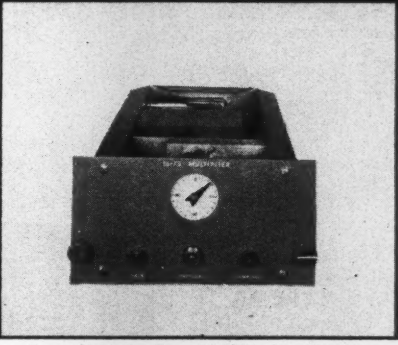

Variplotter, Model 1100 (table model). Send for special flyer.

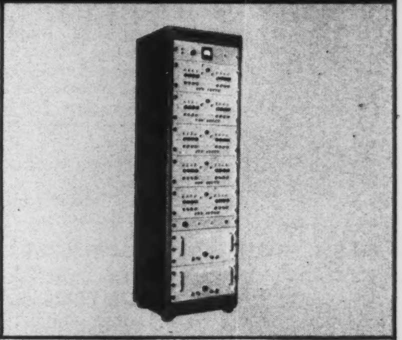

Dataplotter system Type 3033 A. Special flyer on request.


Variplotter Model 205 J&H. Get special flyer.

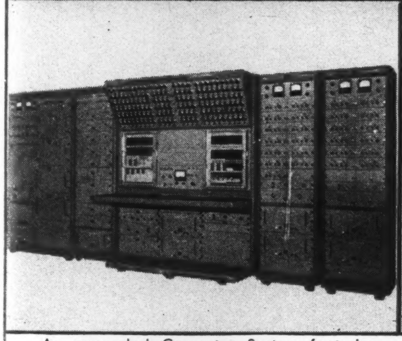
FOR PROGRESS

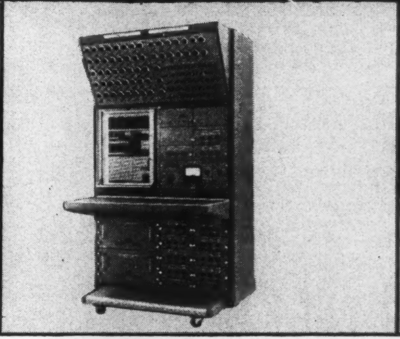

Six Channel Recorder, Model 1902A. Ask for special specification flyer.

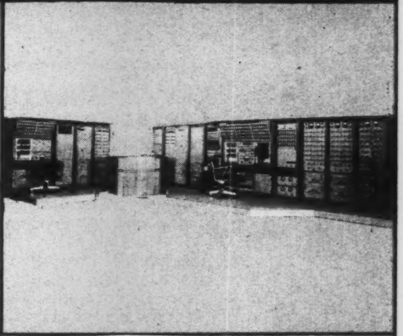

Servo Multiplier Type 16-7S(1). Specification flyer available.


Electronic Multiplier Type 16-31T. Send for specification flyer.

ELECTRONIC ASSOCIATES


An expanded Computer System featuring unique building-block system. Brochure on request.


Computer Group, Type 16-31R. (Also available with push button controls.) Full brochure available.


One of EAI's Computation Centers where equipment and time are available on a rental basis. The Center pictured is at Princeton, N. J.

Trust PACE has become a byword in industry. For experience has proved that you can rely on PACE Equipment for reliability, stability, and accuracy. You can trust PACE Equipment, too, for latest developments in the field of computation. Developments such as the Problem Check, which permits fast accurate check of problem patching. For details contact Electronic Associates, Inc., Long Branch, N. J. Dept. IAA.

ELECTRONIC
ASSOCIATES
Incorporated

EAI SETS THE **P** PRECISION **A** ANALOG **C** COMPUTING **E** EQUIPMENT

LONG BRANCH · NEW JERSEY

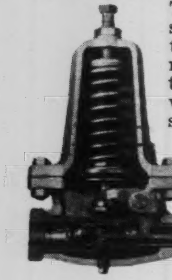
For more information circle **57** on inquiry card.

CASH STANDARD and CASH STANDARD STACON

AUTOMATIC *Pressure, Hydraulic, Temperature, Process and Combustion Controls*

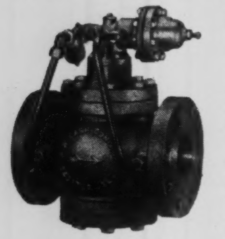
The A. W. CASH COMPANY, and its subsidiary, CASH STANDARD STACON CORP., under the trade marks CASH STANDARD and CASH STANDARD STACON, manufacture a complete line of automatic valves, regulators, controllers, governors, hydraulic valves, refrigeration back pressure valves and complete systems for process and combustion control. A few of the many items available are described on this page.

CASH STANDARD STREAMLINED REDUCING VALVE, TYPE 1000



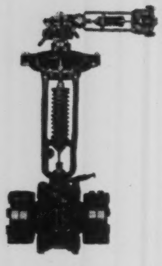
Three principles used in this regulator assure high capacity and close pressure control: a streamlined inner valve which eliminates turbulence; straight-line flow through the valve housing; an aspirating effect which controls valve opening by amplifying slight pressure changes into large valve operating forces. Two types: 1000-HP (illustrated); 1000-LP with larger diaphragm for low pressures. Iron, bronze, steel or stainless steel body; iron, bronze or stainless steel trim. For steam, water, air, oil and most gases and chemicals. Eight sizes from ¼" x ¼" to 2" x 2½" with expanded outlet if desired.

CASH STANDARD PILOT-OPERATED, SELF-CONTAINED CONTROL VALVE, TYPE 10



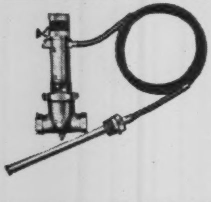
Easily converted from a pressure reducing valve to a back pressure valve by simply switching control piping. Suitable for water, air, gas, oil or refrigerating fluids. Features dial type range selector for stabilizing control pressure. Iron, bronze or steel body; bronze, stainless steel or monel trim. Sizes, 2" to 12" with flanged ends and 2" to 3" with screwed ends.

CASH STANDARD PILOT OPERATED PRESSURE REDUCING VALVE, TYPE 30-AP



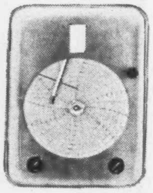
For steam, air and most fluids. Pilot is normally operated by independent fluid. Manner of connecting control lines to pilot and installing reversible inner valve makes this a pressure reducing and regulating valve or a relief or back pressure valve, and determines whether main valve opens or closes with failure of operating fluid delivered to pilot. Air cooled or water cooled packing box. Iron, bronze or steel body; bronze or stainless steel trim. Screwed ends, sizes ½" to 3", flanged ends, sizes 1" to 12".

STACON SELF OPERATING TEMPERATURE REGULATOR, TYPE UBA



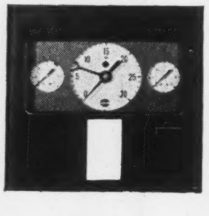
Double seat balance is obtained in a single seated valve by two equally opposed bellows in balance. Vapor filled thermostatic system with brass armored copper capillary and bulb. Type UBA available in sizes ¼", ⅜" and ½", screwed ends, and has temperature adjustment dial on the valve.

CASH STANDARD RECORDING CONTROLLER, TYPE 57

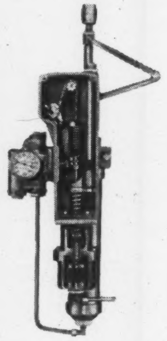


An air operated temperature controller with mercury, vapor, gas or organic liquid actuation. Temperature ranges from −350°F. to 1200°F. Available in 9" and 12" case size, spring or electric driven chart drive, on-off control or 1-100% proportional control. All units have push button nozzle cleaner; proportional controllers also have sapphire jewelled relay orifice with push button cleaner.

CASH STANDARD INDICATING CONTROLLER, TYPE 51



An air operated, mercury actuated proportional temperature controller. Temperature ranges from −40°F. to 1000°F. Calibrated set point adjustment, unit construction, air relay with sapphire orifice and push button cleaner, feedback typed proportional control with 1-100% band and differential gap. Also available with 1-150% proportional band combined with automatic reset action.



CASH STANDARD POSITIONER, TYPE 100

A sensitive controller to operate Balanced Valves, Butterfly Valves, Dampers, Stokers and other apparatus or may be interposed as a positioner between pressure or temperature pilot and apparatus being operated.

STACON SELF OPERATING TEMPERATURE REGULATOR, TYPE V

Features a liquid filled thermal system for high operating power and uniform throttling action, and has built-in overload protection. Available in 50°F. and 100°F. ranges from 25° to 325°F. Direct and reverse acting units ¼" to 1½" with screwed ends, and 2" to 4" with flanged ends.

A. W. CASH COMPANY **and its subsidiary, CASH STANDARD STACON CORP.**
P. O. Box 551
Decatur, Ill.

For more information circle **58** on inquiry card.

about this 1957
Instruments and Automation
HANDBOOK & BUYERS' GUIDE

This 1957 I&A Handbook & Buyer's Guide is the 14th edition of a directory which has assumed a position as the most complete and authoritative source for instruments and automation (control) equipments. It contains three basic parts:

1. Index Section—telling "who makes what." Here, all instruments and control equipments are listed alphabetically, giving the names of all manufacturers who make, let us say, "Pressure Recorders."

Indexing System—all listings are made by basic variable. In other words, look for "pressure," "temperature," "flow," "level," "analytical instruments," etc. DO NOT look for "instruments," "gages," "meters," "indicators," etc., except for the special case of general-purpose instruments, such as "Recorders." This new approach—a listing by variable—has necessitated a complete revamping of the previous indexes—and will necessarily produce a few omissions for which we beg the reader's indulgence. They will be ironed out as we discover them and as you tell us about them.

2. Address Section—telling the address of the company desired as a source for the equipment located in the Index Section. Here you will find the addresses of about 3200 companies. When seeking a specific item, it will pay to drop a note to all the companies listed as sources for the item desired. Each has its specialties and specialized features.

3. Handbook Data: Nineteen tables of commonly needed data are given on the subjects of pressure and temperature.

Further Service—if you cannot locate the product or the manufacturer, or if you are seeking a rare or exotic instrument, refer your problem to our Reader Service Department, Instruments Publishing Company, 845 Ridge Avenue, Pittsburgh 12, Pa.

INDEX SECTION

ABRASION MACHINES and TESTERS

Amer. Instr. Co.
Amthor Testing
Atlas Electric Devices
Baldwin-Lima-Hamilton
Custom Scientific Insts.
Fidelity Mach. Co.
Gardner Laboratory
GE
Larson Instr. Co.
Morehouse Machine Co.
Olsen Testing Machine
Pacific Scientific
Riehle Div.
Scott Testers, Inc.
Shawmut Engrg. Co.
Soiltest, Inc.
Suter, Alfred
Taber Instr. Corp.
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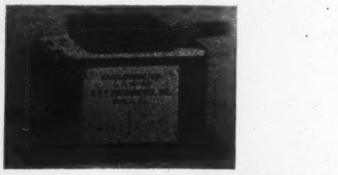
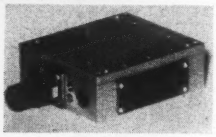

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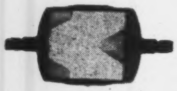

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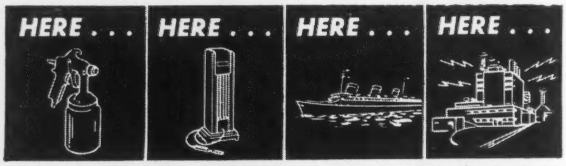

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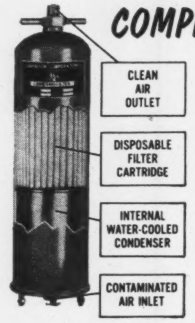

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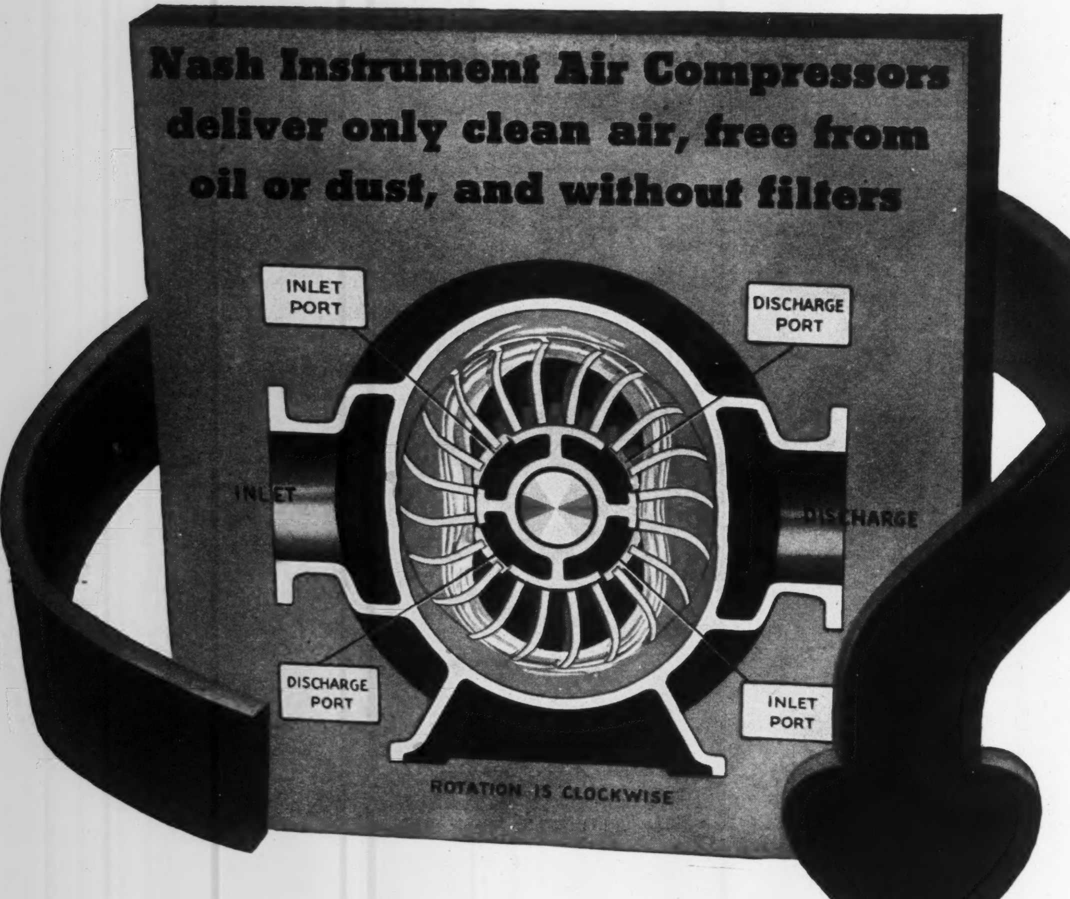
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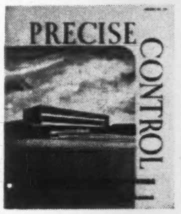

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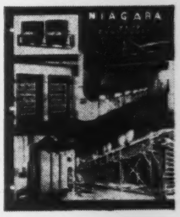

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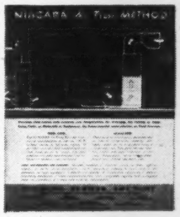

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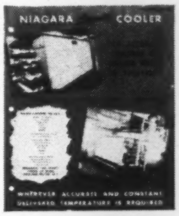
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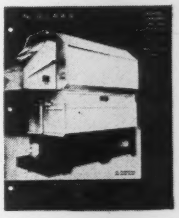

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Gadgets Inc.
Geier & Bluhm
GE
General Mills Inc.
Genisco Inc.
Giannini & Co.
Gordon Enterprises
Goodyear Tire
Guardian Electric
Hanson-Gorrill-Brian
Hastings-Raydist
Hathaway Instr. Co.
Haydon Co., A. W.
Helco Prods. Corp.
Helipot Div.
Ideal-Aerosmith
Ideal Lab. Tool
Illinois Testing Labs.
Impact Register Co.
Industrial Test Equipt.
Instr. Assocs.
Internat. Std. Trading
Jaeger Watch
Jarvis Electronics
Kearfott Co.
Kearfott Co., Western Div.
Kollsman Instr. Corp.
Lackner Co.
Lear, Inc.
Leslie Co.
Lewis Engrg. Co.
Liquidometer Corp.
Machlett & Son
Magnetic Amplifiers Inc.
Manning, Maxwell & Moore
Marion Electcl. Instr.
Mason-Neilan Div.
Matisa Equipt. Co.
Maxson Corp.
Meriam Instr. Co.
Microloc Corp.
Midwestern Instruments
Minneapolis-Honeywell
Moeller Instr. Co.
Natl. Aircraft Corp.
Norden-Ketay
North Amer. Instr. Co.
Pacific Labs.
Penn Indust. Instr. Corp.
Rahm Instruments
Raytheon Mfg. Co.
Rea Co., J. B.
Reeves Instr. Div.
Refinery Supply
Republic Mfg. Co.
Revere Corp. of Amer.
Rieker Instr. Co.
Rochester Mfg.
Sensitive Research Instr.
Serdex, Inc.
Servo Corp. of Amer.
Servomechanisms, Inc.
Sheffield Corp.
Simmonds Aerocessories
Simplex Valve & Meter
Simpson Electric
Slip Ring Co. of Amer.
Specialties, Inc.
Sperry Gyroscope
Standard Products Inc.
Starrett Co.
Streeter-Amet
Summers Gyroscope
Taller & Cooper
Tejax Engrg. Corp.
Televiso Co.
Ten Bosch Inc.
Tenney Engrg. Co.
Thermo-Elect. Co.
Topp Industries
Transval Engrg. Corp.
Trimount Instr. Co.
Triplett Electcl. Instr.
U. S. Gauge Div.
Vectron, Inc.
Victory Engrg.
Wallace & Tiernan
Wang Labs.
Warren-Knight
Waugh Labs.
West Coast Electronics
Westberg Mfg.
Westinghouse Electric
Weston Electcl. Instr.
Westport Electric
White Co., David
Whittaker Gyro Div.
Wiancko Engrg. Co.
Winslow Co.
Zernickow Co.

AIRCRAFT NAVIGATIONAL INSTRUMENTS, see Navigation Aids

AIRCRAFT POWER PLANT INSTRUMENTS

Aero Instr. Co.
Aeromarine Instr. Co.
Aero Research
Airborne Instruments Lab.
Airflo Instr. Co.
Associated Res., Inc.
Aviation Engrg. Co.
Avien, Inc.
Avion Div.
Avionic Products Engrg.
B & H Instr. Co.
Beck Bros.
Bendix, Eclipse-Pioneer
Bendix, Pioneer Central
Bogue Electric
Boston Auto Gage Co.
Bowser Inc.
Bristol Co.
Brooks Rotameter
Cambridge Instr. Co.
Colvin Labs., Inc.
Control Engrg. Corp.
Datran Engrg.
DeJur-Amsco
Edison Inc., Thomas A.
Electro Prods. Labs.
Federal Telephone & Radio
GE, Instr. Dept.
Gilmore Industries
Griswold Mfg.
Hasler-Tel Co.
Haydon Co., A. W.
Hays Corp.
Hickok Electcl. Instr.
Howell Instr. Co.
Instr. Assocs.
Jaeger Watch
Kistler Instr. Co.
Kollsman Instr.
Lewis Engrg. Co.
Liquidometer Corp.
Magnetic Research Corp.
Manning, Maxwell & Moore
Marion Electcl. Instr. Co.
Moisture Register Co.
Norden-Ketay
Penn Indust. Instr. Corp.
Phaostron Co.
Rahm Instruments
Ram Meter, Inc.
Revere Corp. of Amer.
Rieker Instr. Co.
Roller-Smith
Sensitive Res. Instr.
Servonic Instr. Inc.
Sperry Gyroscope
Standard Products
Stewart-Warner
Thwing-Albert
Triplett Electcl. Instr.
Topp Industries
U. S. Gauge Div.
U. S. Taximeter
Varo Mfg. Co.
WacLine, Inc.
Waugh Engrg. Co.
Westburg Mfg.
Westinghouse Electric
Weston Electcl. Instr.
Winslow Co.

AIRPLANE CONTROLS, Movement Recorders

Aero Electronics
Airborne Instruments Lab.
Amer. Electronics
Arens Controls
Barber-Colman
Bendix, Eclipse-Pioneer
Breeze Corporations
Bristol Co.
Century Geophysical
Colvin Labs.
Cook Electric
Crescent Engrg. & Res. Co.
Doelcam Div.
Dyna-Empire
Engrg. & Res. Corp.
Epsco, Inc.
Flight Research Engrg.
GE
Hamilton Watch
Hathaway Instr. Co.
Heiland Div.
Impact Register Co.
Kollsman Instr. Corp.
Lear Inc.
Magnetic Amplifiers Inc.
Marion Electcl. Instr. Co.
Norden-Ketay
North Amer. Instr. Co.
Pacific Scientific
PIC Design Corp.
Radiation, Inc.
Revere Corp.
Servonic Insts.
Sheffield Corp.
Sound App. Co.
Streeter-Amet
Summers Gyroscope
Teleflex, Inc.
Thermix Corp.
United Control Corp.
Victory Engrg. Corp.
WacLine, Inc.
Westinghouse Air Brake Co.
Wiancko Engrg. Co.

AIRPORT INSTRUMENTS, see Aviation Instruments, Ground

AIRSPEED INDICATORS, see Aircraft Instruments

AIRSPEED INDICATOR TESTERS, see Aircraft Instruments

ALARM GAGES, see Pressure Gages with Alarms

ALARMS, Bearing Temperature, see Bearing Temperature Instruments

ALARMS, Bin Level, see Level Control, Bin

ALARMS, Carbon Bisulphide, see Gas Analyzers

ALARMS, Carbon Monoxide, Combustible Gas etc., see Gas Analyzers

ALARMS, High/low, water, see Level Controllers, Liquid

ALARMS, Hydrogen Sulphide, see Gas Analyzers

ALARMS, Inflammable Gas, see Gas Analyzers

ALARMS, Radiation, see Radiation Alarms

ALARMS, Smoke, see Smoke Density Indicators, Recorders

ALIDADES, See Surveying Instruments

ALKALIMETERS, see pH

ALLOYS, Compensator, see Alloys, Temperature

ALLOYS, Glass Sealing

Allegheny-Ludlum
Alpha Metals
Amer. Platinum Works
Amer. Silver Co.
Bishop & Co., J.
Cerro de Pasco Corp.
Crucible Steel
Division Lead
Driver Co., Wilbur B.
Driver-Harris Co.
Federated Metals Div.
General Plate Div.
Hermaseal Co.
Jessop Steel
Mallory & Co., P. R.
Precision Tube Co.
Simonds Saw & Steel
Stupakoff Div.
Uhrig Co.
Universal-Cyclops
Westinghouse Electric
Wilson Co.

ALLOYS, High Permeability including Hipernik, Mu-metals, Permalloy, etc.

Allegheny-Ludlum
Amer. Silver Co.
Arnold Engrg. Co.
Chatillon & Sons
Jessop Steel Co.
Magnetics, Inc.
Pyroferric Co.
Simonds Saw & Steel
Thomas & Skinner
Universal-Cyclops
Westinghouse Electric

ALLOYS, Special, Gold Spring

Amer. Platinum Wks.
Amer. Silver Co.
Baker & Co.
Bishop & Co., J.
Brainin Co., C. S.
Chatillon & Sons
Cohn, Corp., Sigmund
Dow Chem.
General Plate Div.
Handy & Harman
Haynes Stellite
Ney Co.
Secon Metals Corp.
Sherman & Co.
Wilson Co.

ALLOYS, Special, including Cupaloy, Duronze, Elinvar Olympic

Allied Prods. Div.
Amer. Brass Co.
Arnold Engrg. Co.
Bridgeport Brass Co.
Chase Brass & Copper
Chatillon & Sons
Disston & Sons
Dow Chem.
Driver Co., Wilbur B.
Driver-Harris
Eaton Mfg. Co.
Ferner Co.
Hamilton Watch
Simonds Saw & Steel
Wall Colmonoy
Wheaton Co.
Wilson Co.

ALLOYS, Special, including Invar, Konal, Kovar, Z-Metal

Allegheny-Ludlum
Amer. Silver Co.
Chatillon & Sons
Dow Chem.
Driver-Harris
Ferner Co.
General Plate Div.
Halcomb Steel
Jessop Steel
Mico Instr. Co.
Simonds Saw & Steel
Stupakoff Div.
Universal-Cyclops
Wilson Co.

ALLOYS, Special, Magnesium

Dow Chem.
Federated Metals Div.
Hills-McCanna
North Amer. Philips

ALLOYS, Special, Nickel Silver

All-State Welding Alloys
Alpha Metals
Amer. Brass Co.
Amer. Silver Co.
Belmont Smelt. & Ref.
Driver Co., Wilbur B.
Federated Metals Div.
Gallien, R. P.
Hamilton Watch
Hubbell Metals
International Nickel
Mallory & Co., P. R.
Revere Copper & Brass
Scovill Mfg.
Secon Metals Corp.
Sherman & Co.
Western Brass Mills
Wilson Co.

ALLOYS, Special, Silver Brazing

Allen Co.
Alpha Metals
Amer. Platinum Works
Amer. Silver Co.
Baker & Co.
Belmont Smelt. & Ref.
Dixon, Inc.
General Plate Div.
Handy & Harmon
Hubbell Metals
Mallory & Co., P. R.
Metals & Controls Corp.
Ney Co.
Wilson Co.

ALLOYS, Temperture Compensator

Amer. Silver Co.
Chatillon & Sons
Driver Co., Wilbur B.
Driver-Harris
GE
Hamilton Watch
Jessop Steel
Simonds Saw & Steel
Wilson Co.

ALTIMETERS, see Barometers, Altitude

ALTIMETERS, Aircraft, see Aircraft Instruments

ALTIMETERS, Surveying, see Barometers

ALTIMETER TESTERS, see Aircraft Instruments

ALTITUDE BAROMETERS, see Barometers, Altitude

ALTITUDE GAGES (Boiler), see Boiler Room Instruments

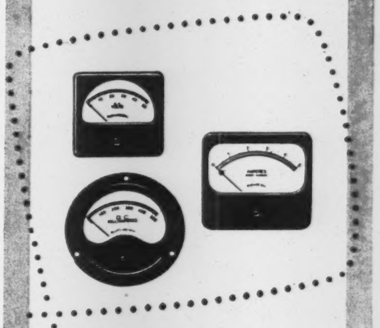
ALTITUDE VALVES, see Valves, Relief

ALUMINUM FRAMES for Small Moving Coils

A & M Tool & Die
Rex Rheostat
Uniform Tubes

AMMETERS, A C and/or D C, Single or Multi-range, Indicating

Assembly Products
Associated Res. Inc.
Ballantine Labs.
Barber-Colman
Beede Electcl. Instr. Co.
Bendix, Eclipse-Pioneer



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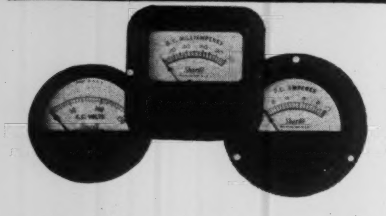

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Columbia Elect. Mfg.
Dale Instruments
DeJur-Amsco
Dittmore & Freimuth
Electric Auto-Lite
Elect. Design & Mfg.
Electro Mechanical Div.
Electro-Tech Equipt.
Electronic Devel. Labs.
Electronic Instr. Co.
Electronic Measmts Co.
Englehard Inc., Charles
Esterline-Angus
Ferranti Electric
Fielden Instr. Div.
Gar Electcl. Instr.
GE, Apparatus Sales
GE, Instr. Dept.
Greibach Instruments
Helipot Div.
Hickok Electcl. Instr.
Instrument Laboratories
Internatl. Instruments Inc.
J-B-T Insts.
Lewis Engrg. Co.
Magnetic Industries
Manning, Maxwell & Moore
Marion Elect. Instr. Co.
Meters, Inc.
Miller, M. C.
Niagara Electcl. Instr.
Norton Electcl. Instr.
Pace Electcl. Instr.
Phaostron Co.
Physics Research Labs.
Pimex, Inc.
Precision App. Co.
Pyramid Instr. Co.
Radio City Products
Rawson Electcl. Instr.
Rochester Mfg.
Roller-Smith
Sendur Mfg.
Sensitive Res. Instr.
Shurite Meters
Simpson Electric
Sterling Mfg. Co.
Stewart-Warner
Sticht Co., Herman H.
Sun Electric
Texas Insts., Inc.
Triplett Electcl. Instr.
United Electric
United Optical
U. S. Gauge Div.
WacLine, Inc.
Welch Mfg. Co., W. M.
West Instr. Corp.
Westinghouse Electric
Weston Electcl. Instr.
Wheelco Instr. Div.
Winslow Co.

AMMETERS, Clamp Type

Bristol Co.
Columbia Electric
Dale Instruments
Electronic Development
Ferranti Electric
GE, Appartus Sales
GE, Instr. Dept.
H. D. Electric
Hickok Electcl. Instr.
Internat. Std. Trading
Martindale Elecrtic
Pimex, Inc.
Pyramid Instr. Corp.
Rochester Mfg.
Schweitzer Mfg.
Sticht Co., Herman H.
United Optical
U. S. Gauge Div.
Weston Electcl. Instr.

AMMETERS, Contact-making

Assembly Products
Bristol Co.
Burlington Instruments
Dittmore & Freimuth
Esterline-Angus
Fielden Instr. Div.
GE, Apparatus Sales
GE, Instr. Dept.
Hickok Electcl. Instr.
Larson Instr. Co.
Lewis Engrg. Co.
Marion Electcl. Instr. Co.
Phaostron Co.
Rochester Mfg.
Roller-Smith
Sensitive Res. Instr.
Simpson Electric
Triplett Electcl. Instr.
United Electric
West Instr. Corp.
Wetsinghouse Electric
Weston Electcl. Instr.

AMMETERS, Laboratory Standard

Burlington Instr. Co.
Central Scientific
Fisher Scientific
GE, Apparatus Sales
GE, Instr. Dept.
Greibach Instruments
Hickok Electcl. Instr.
Kay Lab.
Marion Elect. Instr. Co.
Phaostron Co.
Physics Research Labs.
Rawson Electcl. Instr.
Roller-Smith
Sensitive Res. Instr.
Simpson Electric
Triplett Electcl. Instr.
United Optical
Welch Mfg. Co., W. M.
Weston Electcl. Instr.
Will Corp.

AMMETERS, Microammeters and Milliammeters

Applied Physics
Assembly Products
Ballantine Labs.
Barber-Colman
Beckman Div.
Beede Electcl. Instr.
Beta Electric
Bradshaw Instruments
Bristol Co.
Burlington Instr. Co.
Burton-Rogers
Cambridge Instr. Co.
Chicago Indust. Instr. Co.
Clough-Brengle
Dale Instruments
DeJur-Amsco
Dittmore & Freimuth
Doelcam Div.
Elect. Design & Mfg.
Electro-Mech. Instr.
Electronic Devel. Lab.
Electronic Instr. Co.
Electronic Measmts. Co.
Engelhard Inc., Chas.
Esterline-Angus
Fielden Instr. Div.
Fisher Scientific
Gar Electcl. Instr.
GE, Apparatus Sales
GE, Instr. Dept.
Greibach Instruments
Hickok Electcl. Instr.
Industrial Control Co.
Internat. Instr. Co.
J-B-T Insts.
Kay-Lab
Keithley Instruments
Leeds & Northrup
Lewis Engrg. Co.
MacDonald Co. W. S.
Magnetic Industries
Manning, Maxwell & Moore
Marion Elect. Instr. Co.
Meters, Inc.
Mil Instr. Corp.
Miller, M. C.
Millivac Instr. Co.
Norton Electcl. Instr.
Pace Electcl. Instr.
Pfaltz & Bauer
Phaostron Co.
Physics Res. Labs.
Pimex, Inc.
Precision App. Co.
Pyramid Instr. Co.
Radio City Products
RCA Tube
Rawson Electcl. Instr.
Reiner Electronics
Roller-Smith
Scientific Specialties
Sensitive Res. Instr.
Shallcross Mfg.
Shelby Instr. Co.
Shurite Meters
Simpson Electric
Std. Science Supp.
Sun Electric
Supreme, Inc.
Technology Instr. Div.
Texas Insts., Inc.
Thwing-Albert
Triplett Electcl. Instr.
Triumph Mfg.
United Electric
United Optical
WacLine, Inc.
Wallace & Tiernan
Waveforms, Inc.
Welch Mfg. Co., W. M.
West Instr. Corp.
Westinghouse Electric
Weston Electcl. Instr.
Winslow Co.

AMMETERS, Recording

Autocall Co.
Barber-Colman
Bristol Co.
Brush Electronics
Cambridge Instr. Co.
Dittmore & Freimuth
Edin Electronic
Engelhard Inc., Chas.
Esterline-Angus
Fielden Instr. Div.
GE, Apparatus Sales
GE, Instr. Dept.
HD Electric
Kay Lab.
Larson Instr. Co.
Leeds & Northrup
Manning, Maxwell & Moore
Massa Labs.
Metrotype Corp.
Minneapolis-Honeywell
Physics Res. Labs.
Precise Measmts. Co.
Roller-Smith
Sanborn Co.
Sangamo Electric
Sound Apparatus
Taller & Cooper
Texas Insts., Inc.
Wallace & Tiernan
Westinghouse Electric
Weston Electcl. Instr.
Wheelco Instr. Div.

AMMETERS, Split Core

Bristol Co.
Columbia Elect. Mfg.
Dale Instruments
Ferranti Electric
GE, Apparatus Sales
GE, Instr. Dept.
HD Electric
Norton Electcl. Instr.
Physics Res. Labs.
Pyramid Instr. Corp.
Roller-Smith
Rubicon Co.
Sticht Co., Herman H.
Triplett Electcl. Instr.
Weston Electcl. Instr. Corp.

AMMETERS, Thermo, including Milliammeters

Assembly Products
Beede Electcl. Instr.
Bristol Co.
Burlington Instr. Co.
Cambridge Instr. Co.
Chicago Indust. Insts.
Dale Instruments
DeJur-Amsco
Dittmore & Freimuth
Electronic Devel. Lab.
GE, Apparatus Sales
Greibach Instruments
Hickok Electcl. Instr.
Lewis Engrg. Co.
Magnetic Industries, Inc.
Marion Electrical Instr.
Meters, Inc.
Physics Res. Labs.
Pyrometer Instr. Co.
Rawson Electcl. Instr.
Roller-Smith
Sangamo Electric
Sendur Mfg.
Sensitive Res. Instr.
Shelby Instr. Co.
Simpson Electric
Sun Electric
Triplett Electcl. Instr.
WacLine, Inc.
Welch Mfg. Co., W. M.
West Instr. Corp.
Westinghouse Electric
Weston Electcl. Instr.

AMMONIA ANALYZERS, see Gas Analyzers

AMMONIA CONTROL EQUIPMENT

Askania Reg. Co.
Autoclave Engrs.
B-I-F Industries
Bailey Meter Co.
Baird Assocs.-Atomic Instr.
Bastian-Blessing
Bristol Co.
Builders-Providence
Cash Valve Mfg. Corp.
Dahl & Co., G. W.
Everson Mfg. Co.
Fischer & Porter Co.
Foster Engrg. Co.
Frick Co.
General Controls
Hammel-Dahl
Hoke, Inc.
Jo-Bell Products
Jordan Reg. Corp.
Lear Inc.
Lumenite Electronic
Magnetrol, Inc.
Marsh Corp., Jas. P.
McAlear Mfg.
Mercoid Corp.
Natural Gas Equipt., Inc.
Phila. Thermometer Co.
Proportioneers, Inc.
R. K. L. Valve & Mfg.
Research Controls
Roy Co., Milton
Scientific Instr. Co.
Schutte & Koerting
Shallcross Controls
Taylor Instr. Cos.
Taylor & Co., W. A.
Thermco Labs.
Wallace & Tiernan
Waukee Engrg. Co.
Weston Electcl. Instr.

AMPEREHOUR METERS

Assoc. Research Inc.
GE, Apparatus Sales
Hetherington & Berner
Landis & Gyr
Sangamo Electric
Texas Insts., Inc.
Westinghouse Electric

AMPLIFIERS, Audio Frequency

ACF Electronics
Acton Labs.
Aerovox Corp.
Air Assocs.
Aircraft Radio Corp.
Alcor Electronics Corp.
Altec Lansing
Amer. Electronic Labs.
Amer. Helicopter Div.
Amplifier Corp. of Amer.
Arrow Electronics
Authorized Mfrs. Serv.
Avion Div.
Baird Assocs.-Atomic Instr.
Ballantine Labs.
Berkshire Labs.
Berndt-Bach
Brit. Industries Corp.
Brush Electronics
Bunnell & Co.
Calidyne Co.
Canoga Corp.
Cedar Engrg. Co.
Centralab Div.
Computer Corp. of Amer.
Computer Engrg. Assocs.
ConRay Corp.
Control Corp. of Amer.
Davenport Mfg.
Daystrom Instr. Div.
DuMont Labs., Allen B.
ElDorado Electronics
Electro Devices Inc.
Electro Mechanical Div.
Electro Voice, Inc.
Electronic Res. Assocs.
El Mec Labs.
Endevco Corp.
Erdco Engrg. Co.
Erwood, Inc.
Femco, Inc.
Fisher Res. Lab.
Franklin Electronics
Freed Transf. Co.
Furst Electronics
Genzlinger, Inc.
Gulton Mfg. Corp.
Hermetic Sealing Corp.
Hewlett-Packard
Hydro-Aire, Inc.
Indust. Test Equipt. Co.
Industronics
Instrument Devel. & Mfg.
Instrument Laboratories
Interelectronics Corp.
Johnson Co., E. F.
K-F Devel. Co.
Kay Electric
Keithley Instruments
Kinetic Insts.
Krohn-Hite
Lear, Inc.
L & O Res. & Devel. Co.
Magnecord, Inc.
Magnetic Instr. Co.
MB Mfg.
Nelson Instr. Co.
Nems-Clarke
Peer, Inc.
Precision Electronics, Inc.
Precision Radiation Insts.
Radio Frequency Labs.
Rauland-Borg
Remler Co.
Rheem Mfg.
Sanborn Co.
Scott, Inc., Herman Hosmer
Sierra Electronic Corp.
Std. Electronic Res.
Tarc Electronics Inc.
Technical App. Builders
Technology Instr. Corp.
Thermador Electcl. Mfg.
Thordarson-Meissner
Topp Industries
Transmag Div.
Transval Engrg. Corp.
Transvision, Inc.
Tri-Dex Electronics
Trio Labs., Inc.
Varo Mfg. Co.
Vectron, Inc.
Virginia Electronics
WacLine, Inc.
Walkirt Co.
Westinghouse Electric
Westronics, Inc.
Wheeler Insul. Wire, Inc.
Yellow Springs Instr.

AMPLIFIERS, Chopper

Allegeny Instr. Co.
Amer. Electronics Labs.
Askania Reg. Co.
Audio Instr. Co.
Berkeley Div.
Bristol Co.
Brit. Electronic Sales
Brush Electronics
Davenport Mfg. Co.
Edin Co.
El Mec Labs.
Electro Mechanical Div.
Electron. Spec. Co.
Franklin Electronics
Hoover Electronics Co.
Indikon Co.
Industrial Control Co.
Jack Scient. Instr. Co., Bill
Kay-Lab
Magnetic Instr. Co.
Magnetic Research Corp.
Mid-Century Instrumatic
Offner Electronics
Parsons Co.
Phoenix Prec. Instr.
Photron Instr. Co.
Reeves Instr. Corp.
Rheem Mfg.
Sanborn Co.
Servomechanisms, Inc.
Stoelting Co.
Transval Engrg. Corp.
Trio Labs., Inc.

AMPLIFIERS, Commercial Frequency

Aero Electronics
Air Associates
Airdesign, Inc.
Allied Engrg. Div.
Amer. Electroneering
Amer. Machine & Foundry
Amplifier Corp. of Amer.
Assembly Products
Ballantine Labs., Inc.
Bell Sound Systems
Bendix Aviation Corp.
Bogue Electric Mfg.
Brit. Electronic Sales
Cal-Tronics Corp.
Commercial Research Div.
Edin Co., Inc.
El Mec Labs.
Electro Voice, Inc.
Electronic & Engrg. Serv.
Engr. Res. & Devel.
Erwood, Inc.
F. R. Machine Works
Feiler Engrg. Co.
Femco, Inc.
Fluke Mfg.
Freed Transf. Co.
Furst Electronics
GE
General Mills Inc.
General Radio
Geotechnical Corp.
Hathaway Instr. Co.
Industrial Electronics
Industrial Test Equipt.
Interelectronics Corp.
Kahn & Co.
Kay-Lab
Kaye Devel. Co.
Keithley Instruments
Krohn-Hite
Langevin Mfg.
MacLeod & Hanopol
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Magnetic Instr. Co.
Martin-Hubbard
McFarlin Co.
Metrotype Corp.
Millen Mfg.
New London Instr. Co.
Radio Receptor Co.
RCA Div.
Raytheon Mfg.
Rheem Mfg.
Reeves Instr. Div.
Reiner Electronics
Remler Co.
Rockwell Engrg. Co.
Rowe Engrg. Co.
Sanborn Co.
Scott Inc., Hermon Hosmer
Servomechanisms, Inc.
Sherron Metallic Corp.
Southw. Ind. Electronics
Tektronix, Inc.
Televiso Co.
Thordarson-Meissner
Transval Engrg. Corp.
Transvision, Inc.
Vectron, Inc.
WacLine, Inc.
Waterman Products
Wilmar Mfg.

AMPLIFIERS, DC

ACF Electronics
Acton Labs.
Advance Electronics
Aero Electronics
Air Associates
AiResearch Mfg.
Airpax Products
Allegany Instr. Co.
Allied Eng. Div.
Allied Products Div.
Allied Radio
Amer. Electroneering
Amer. Electronic Labs.
Amer. Mach. & Foundry
Amplifier Corp. of Amer.
Antenna Research Lab.
Applied Physics Corp.
Arnoux Corp.
Audio Instr. Co.
Avion Div.
Baird Assocs.-Atomic Instr.
Beam Instruments
Bendix, Pacific Div.
Berkeley Div.
Bogue Electric Mfg.
Bristol Co.
Brit. Electronic Sales
Brush Electronics
Cal-Tronics Corp.
Calidyne Co.
Century Geophysical
Cinema Engrg. Co.
Clevite-Brush
Collins Radio
Computer Co. of Amer.
Computer Engrg. Assocs.
Concord Radio
Consol. Electrodynamics
Daystrom Instr. Div.
Devtronics, Inc.
Diatron Co.
Dittmore & Freimuth
Doelcam Div.
Donner Scientific
Dressen-Barnes
DuMont Labs., Allen B.
Eastern Prec. Resistor
Edin Co.
El Mec Labs.
Electro Mechanical Div.
Electro-Mechanical Res.
Electro-Medical Lab.
Electronic Assocs.
Electronic Controls, Inc.
Electronic Engrg. Assocs.
Electronic & Engrg. Serv.
Electronic Measmts. Co.
Electronic Prods. Co.
Electronic Res. Assocs.
Electronic Tube Corp.
Ellis Associates
El-Tronics, Inc.
Engineered Electronics
Engineering Res. & Devel.
Erwood, Inc.
Farrand Optical
Federal Telephone & Radio
Feiler Engrg. Co.
Femco, Inc.
Fielden Instr. Div.
Ford Instr. Co.
Franklin Electronics
Furst Electronics, Inc.
GE
General Radio
Geotechnical Corp.
Goodyear Aircraft
Hagan Corp.
Hathaway Instr. Co.
Hoover Electronics
Heiland Div.
Hycon Electronics
Indust. Test Equipt. Co.
Industrial Control Co.
Instrument Labs.
Internat. Std. Trading
Jack Scient. Instr. Co., Bill
James Vibrapowr Co.
Jarco Services
Kahn & Co.
Kay-Lab
Kaye Devel. Co.
Keithley Instruments
Keystone Products
Langevin Mfg. Corp.
Lear, Inc.
Leeds & Northrup
Lewyt Metal Prods.
Librascope Inc.
Link Aviation Inc.
Liston-Folb
MacLeod & Hanopol
Magnetic Amplifiers Inc.
Magnetic Instr. Co.
Magnetic Res. Corp.
Mag Elect. Prods.
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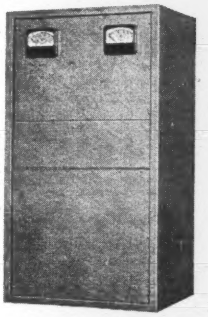
McFarlin Co.
Metrotype Corp.
Mid-Century Instrumatic
Midwestern Instruments

M R C *magnetic research corp.*

a complete line of ALL-MAGNETIC COMPONENTS and MAGNETICALLY REGULATED POWER SUPPLIES



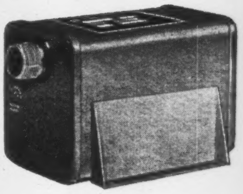
STABLVOLT* DC COMPUTER POWER SUPPLY

Dual magnetic regulation—line transient-free

Stablvolt d.c. power supply provides line transient-free, precision-regulated d.c. output voltage, meeting the strict requirements for analog and digital computer applications. Flux oscillator controlled. Very low ripple, excellent dynamic and static regulation. Extremely low internal impedance. Maintenance-free. Ultra-fast response. Short-circuit proof. Available in a wide range of voltage and current levels.

Write for complete data.

TUBELESS PRECISION MISSILE AND AIRCRAFT INSTRUMENT POWER SOURCE MRP-5-1S

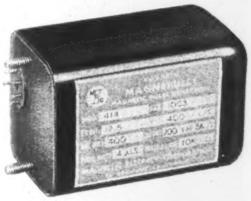


5 VDC transient-free output

Dual magnetic system isolates line voltage transients from the output, regulates d.c. to 0.1% accuracy. Does not distort line voltage wave form. Use of 2306-55 Cannon connector permits unit to carry 115 VAC up to 60,000 feet. A 25-turn Trimpot has 5 millivolt resolution, provides 0.5 volt output adjustment. Mounts easily in any position. Rugged, compact, short circuit-proof. Current capacity, 1 amp. Vibration tested with 15g up to 2,000 cps. Hermetically sealed; all components cast in thermosetting plastic. Meets MIL-T-27 and MIL-E-5272-A specs.

For full data, request Engineering Bulletin EB-5-1

ALL-MAGNETIC AIRBORNE PULSE GENERATOR MP 414

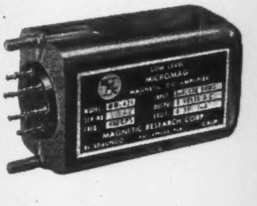


For commercial radar and digital computer uses

Uses only 1 watt of power, provides 250V pulse into 500 ohms. Pulse width: 4.5 microseconds; repetition rate: 400 pps. Weighs only 14 ounces, is hermetically sealed, and operates on 115V-400 cycle supply. No tubes, no moving parts. Short circuit-proof. Units available in ranges from 1 to 10 megawatts to replace conventional hydrogen thyratron pulse modulators in radar systems.

For full data, request Engineering Bulletin EB-204

MICROMAG* LOW-LEVEL MAGNETIC DC SIGNAL AMPLIFIER

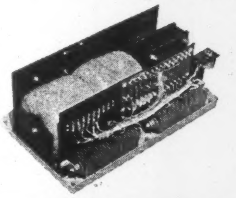


Drift-free—for thermocouple and strain gauge applications in telemetering systems

Provides ripple-free 5 VDC output from 1 millivolt d.c. input, with extremely high gain stability. Response time: 40 milliseconds. No pick-up—no shielding required. No tubes, no warm-up time. Withstands extreme vibration and shock without introducing spurious noise. Reliable in high environmental temperatures. Operates on 400 cycles. Also useful for temperature and strain measurements in industrial and medical work. Weighs less than 7 oz.

For full data, request Engineering Bulletin EB-201-A

HIGH-POWER INDUSTRIAL MAGNETIC SERVO AMPLIFIERS



For servo systems in automatic control

Operate on standard commercial 50-to-60 cps power. Amplifiers are entirely static with power outputs from 0.1 to 5 kw. Compact, rugged units provide maintenance-free, reversible a.c. or d.c. control for high-power a.c. or d.c. servo motors. Transistor or tube control. These single and two-stage magnetic amplifier units require less than 1 watt of control signal power. Response time: Less than 25 milliseconds. Long life, low cost.

Write for complete data.

INSTRUMENT MAGNETIC SERVO AMPLIFIER SERIES

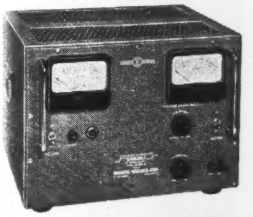
MAGNETIC
MAGNESTAT
SERVO AMPLIFIER
MAGNETIC RESEARCH CORP.
EL SEGUNDO CALIFORNIA

For aircraft and missile servo systems

Precisely engineered Magnestat Magnetic Servo Amplifiers are available from stock, from the smallest model rated at 3 watts, and having a frequency response of 0-30 cps, to the high-power 40-watt model, frequency 0-10 cps. These units have sinusoidal phase reversing output, with transistor or tube control . . . a.c. or d.c. input. Currently being applied in many major aircraft and missile servo systems.

For complete data, request Magnestat Series engineering bulletins.*

DC LABORATORY STABLVOLT POWER SUPPLY MR 532-15



Line transient-free—

ideal for transistor work

Highly versatile, filtered d.c. lab power supply offers continuous, precise regulation from 3 to 36 VDC at 15 amps. Dual magnetic circuitry isolates line voltage transients from the output. Short circuit-proof, maintenance-free. No tubes, no moving parts. Excellent static and dynamic regulation. Has vernier d.c. voltage adjustment control. Uses flux oscillator type AC line voltage regulator. Has many uses in the laboratory, in original equipment and in industrial quality control. Competitively priced.

Write for complete data.

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Millen Mfg. Co.
Miller Instruments
Millivac Instruments
Minneapolis-Honeywell
Minnesota Electronics
Nalley Co.
Norden-Ketay
Offner Electronics
Ohmart Corp.
Oltronix Co.
Olympic Devel. Co.
Parsons Co.
Perkin Elmer
Philbrick Researches
Phoenix Prec. Instr.
Photocon Research
Photron Instr. Co.
Photovolt Corp.
Polytechnic Res. & Devel.
Process & Instruments
Radiation Counter Labs.
RCA Div.
Raytheon Mfg.
Reeves Instr. Corp.
Reiner Electronics
Remler Co.
Rheem Mfg.
Richardson-Allen
Rockwell Engrg. Co.
Rowe Engrg. Co.
Sanborn Co.
Servomechanisms, Inc.
Servo-Tek Products
Southw. Ind. Electronics
Special Instruments Lab.
Spencer-Kennedy
Std. Electronic Res.
Stoelting Co.
Technical App. Builders
Technology Instr. Corp.
Tektronix, Inc.
Thordarson-Meissner
Topp Industries
Transval Engrg. Corp.
Trio Labs., Inc.
Underwood Corp.
United Control Corp.
Vectron, Inc.
Virginia Electronics
WacLine, Inc.
Waveforms Inc.
Weber Aircraft
Western Radiation Lab.
Weston Electcl. Instr.
Wiancko Engrg. Co.

AMPLIFIERS, Electrometer

Beckman Div.
Consol. Electrodynamics
Industrial Control Co.
Keithley Instruments
Kistler Instr. Co.
MacLeod & Hanopol
Mid-Century Instrumatic
Transval. Engrg. Corp.

AMPLIFIERS, Logarithmic

Audio Instr. Co.
Color Television, Inc.
Daystrom Instr. Co.
Deltron, Inc.
Donner Scientific
Furst Electronics
Interelectronics Corp.
Kay-Lab
Magnetic Instr. Co.
Mid-Century Instrumatic
Parsons Co.
Phoenix Prec. Instr.
Reeves Instr. Corp.
Sanborn Co.
Tarc Electronics Inc.
Weber Aircraft

AMPLIFIERS, Magnetic, Including Saturable Reactors

Aerovox Corp.
Ahrendt Instr. Co.
AiResearch Mfg.
Airpax Prods.
Allied Engrg. Div.
Amer. Electronics
Amer. Mach. & Foundry
Arnold Magnetics Co.
Arnoux Corp.
Atlas Engrg. Co.
Avion Div.
Bart-Messing
Bendix, Pacific
Berkeley Div.
Berndt-Bach
Bogue Electric
Bone Engrg. Corp.
Brit. Electronic Sales
Butler Mfg.
CGS Labs., Inc.
Calif. Magnetic Cont. Corp.
Carad Corp.
Chicago Std. Transf. Corp.
Clark Controller Co.
Clevite-Brush
Communication Access. Co.
Control Components Co.
Daystrom Instr. Div.
Doelcam Div.
Dormeyer Industries
D & R Limited
Dressen-Barnes
Electronic Res. Assocs.
Electron. Res. Assocs.
Engineered Magnetics
Federal Telephone & Radio
Feedback Controls
Ford Instr. Co.
Freed Transf. Co.
GE, Apparatus Sales
General Ceramics
General Instrument Co.
General Magnetics
Genl. Prec. Lab.
Goldak Co.
Goslin Electric & Mfg.
Gramer-Halldorson
Gudeman Co.
Helipot Div.
Hevi-Duty Elect. Co.
Hycor Div.
Industrial Control Co.
Internat. Std. Trading
Jack Scient. Instr. Co., Bill
Jeffries Transformer
Kearfott Co.
Keystone Products
Lear, Inc.
Librascope, Inc.
Magnavox Co.
Magnetic Amplifiers Inc.
Magnetic Industries, Inc.
Magnetic Instr. Co.
Magnetic Res. Corp.
Magnetics, Inc.
Maxson Instr. Div.
Mercury Electronic
Miller Instruments
Molded Insulation
Natl. Aircraft Corp.
Norden-Ketay
NYT Electronics, Inc.
Peerless Div., Altec
Perkin Engrg. Co.
Polytechnic Res. & Devel.
Potter Instr. Co.
Power Supp. Corp. of Amer.
Ramo-Wooldridge
Raytheon Mfg. Co.
Rheem Mfg. Co.
Sangamo Electric
Servonics, Inc.
Sorenson & Co.
Southw. Ind. Electronics
Specialties Inc.
Sprague Engrg. Corp.
Standard Electrical Prods.
Std. Electronic Res. Corp.
Stator Electric Corp.
Sterling Transf. Corp.
Summers Gyroscope
Technical App. Builders
Thermador Electcl. Mfg.
Thordarson-Meissner
Timely Insts. & Conts. Co.
Topp Indusries
Torwico Electronics, Inc.
Transformers, Inc.
Transmag Div.
Transval Engrg. Corp.
Triad Transf. Corp.
United Transformer Corp.
Varo Mfg. Co.
Vari-L Company, Inc.
Vickers Electric Div.
WacLine, Inc.
Walkirt Co.
Westinghouse Electric

AMPLIFIERS, Miscellaneous, including Geophysical, Nucleonic, Strain-gage Oscillograph, etc.

ACF Electronics
A-V Mfg. Corp.
Acton Labs.
Advanced Electronics Inc.
Aero Electronics
Aeorvox Corp.
Allegany Instr Co.
Allied Engrg. Div.
Allied Products Div.
Amer. Electroneering
Amer. Electronic Labs.
Anton Electronics Labs.
Atlantic Research Corp.
Baird Assocs.-Atomic Instr.
Baldwin-Lima Hamilton
Ballantine Labs.
Brit. Electronic Sales
Browne & Sharpe
Brush Electronics
Calidyne Co.
Century Electronics
Century Geophysical
Chesapeake Instr. Corp.
Clevite-Brush
Consol. Electrodynamics
Control Components Co.
Crescent Engrg. & Res. Co.
Davies Labs.
Daytronic Corp.
Detectolab, Inc.
Diatron Co.
Doelcam Div.
DuMont Labs., Allen B.
Edin Co.
Electl. & Phys. Instr.
Electro-Pulse, Inc.
Electronic & Engrg. Serv.
Electronic Res. Assocs.
Electronic Tube Corp.
Electronics Devel. Lab.
Ellis Associates
Epsco, Inc.
Farnsworth Electronics
Furst Electronics
GE, Apparatus Sales
Geotechnical Corp.
Gilmore Industries
Gulton Mfg.
Gyroscopes, Inc.
Hathaway Instr. Co.
Heiland Div.
Hewlett-Packard
Houston Technical Labs.
I-L-S Instr. Corp.
Indikon Co.
Industrial Electronics
Indust. Test Equipt. Co.
Insco Company
Insts. for Industries, Inc.
Interelectronics Corp.
Kahn & Co.
Kay-Lab
Krohn-Hite
Mag Elect. Prods.
Magnecord, Inc.
Magnetic Amplifiers
Magnetic Instr. Co.
Magnetic Research Corp.
Midwestern Instruments
Miller Instruments
Natl. Aircraft Corp.
Nems-Clarke
Nuclear Corp. of Amer.
Offner Electronics
Oltronix Co.
Phoenix Prec. Instr.
Photron Instr. Co.
Polard Electronics
Polytechnic Res. & Devel.
Process & Instruments
R. S. Electronics
Radiation Instr. Dev. Lab.
Remler Co.
Sanborn Co.
Southw. Indust. Electronics
Spencer-Kennedy
Std. Electronic Res.
Swedish Gage
Technical Insts. Co.
Texas Insts., Inc.
Thermador Electl. Mfg.
Thordarson-Meissner
Thwing-Albert
Timely Insts. & Consts. Co.
Transval Engrg. Corp.
United Controls
Virginia Electronics
Wakefield Industries
Weber Aircraft Corp.
Western Radiation Lab.
White Instr. Labs.

AMPLIFIERS, Radio Frequency

ACF Electronics
Air Assocs.
Airborne Instruments Lab.
Allied Engrg. Div.
Amerac, Inc.
Amer. Electroneering
Amer. Electronic Labs.
Amer. Mach. & Foundry
Audio Devel. Co.
Bendix-Pacific
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Browning Labs.
Bunnell & Co.
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Canoga Corp.
Centralab Div.
C.G.S. Labs.
Clarke Instr. Corp.
Collins Radio
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D & R Limited
Devtronics Inc.
Diatron Co.
Dittmore & Freimuth
DuMont Labs., Allen B.
Electrical & Phys. Instr.
Electro Mechanical Div.
Electro Mech. Research, Inc.
Electro Voice, Inc.
Electronic & Engrg. Serv.
Electronic Tube Corp.
El-Tronics Inc.
Engineering Res. & Devel.
Erdco Engrg.
Farnsworth Electronics
Feiler Engrg. Co.
Ferris Instr. Corp.
F. R. Machine Works
GE, Apparatus Sales
General Magnetics
General Radio
Georator Corp.
Geotechnical Corp.
Goodyear Aircraft
Harvey Radio
Heiland Div.
Hewlett-Packard
Hycon Mfg. Co.
Hydro-Aire Inc.
Insts. for Industries, Inc.
International Telemeter
Jerrold Electronics
Johnson Co., E. F.
K-F Devel. Co.
Kahn & Co.
Kay Electric
Kay-Lab
Kaye Devel. Co.
Kearfott Co.
Lear, Inc.
Linear Equipt. Labs.
L & O Res. & Devel.
Magnetic Instr. Co.
Mag Elect. Prods.
MacFarlin Co.
Measurements Corp.
Metrotype Corp.
Millen Mfg. Co.
Millivac Instruments
Mohawk Electronic
Natl. Aircraft Corp.
Nems-Clarke
New London Instr. Co.
Norden-Ketay
Photocircuits Corp.
Polarad Electronics
R. S. Electronics Corp.
Radio Receptor Co.
Ramo-Wooldridge
Raytheon Mfg.
RCA Div.
Reeves Instr. Div.
Reiner Electronics
Remler Company
Rheem Mfg. Co.
Rowe Engrg. Co.
Sargent-Rayment
Servo. Corp. of Amer.
Sherron Metallic Corp.
Sierra Electronic Corp.
Spencer-Kennedy
Sperry Gyroscope
Std. Electronic Res.
Tarc Electronics Inc.
Technology Instr. Corp.
Tektronix, Inc.
Tele-Dynamics Inc.
Telechrome, Inc.
Thordarson-Meissner
Transvision, Inc.
Triumph Mfg.
U. S. Electronics
Varian Assocs.
Vectron, Inc.
Virginia Electronics
Waterman Products
Waveforms Inc.
Weber Aircraft
Weinschel Engrg. Co.
West Coast Electronics
Wilmar Mfg.

AMPLIFIERS, Servo

A-V Mfg. Corp.
Ahrendt Instr. Co.
Air Associates
Aircraft Armaments
Amer. Electronic Labs.
Arma Div.
Askania Reg. Co.
Atchley, Inc., Raymond
Autron Engrg., Inc.
Avion Div.
Bendix Aviation Corp.
Berkeley Div.
Bogue Electric Mfg.
Bristol Co.
Brit. Electronic Sales
Calidyne Co.
Calif. Magnetic Cont. Corp.
Cedar Engrg., Inc.
Communication Access. Co.
Control Components Co.
Control Specialists, Inc.
Datran Engrg. Corp.
Electro-Mech. Div.
Electron Spec. Co.
Engineered Magnetics
Engrg. & Res. Corp.
Erdco Engrg.
Farnsworth Electronics
Franklin Electronics
Freed Transf. Co.
GE, Apparatus Sales
Goodyear Aircraft
Gyroscopes, Inc.
Helipot Div.
Henschel Corp.
Hycon Electronics
I-L-S Instr. Corp.
Indikon Co.
Industrial Control Co.
Industrial Electronics
Jack Scient. Instr. Co., Bill
Kearfott Co.
L & O Res. & Devel. Co.
Lear, Inc.
Librascope, Inc.
Link Aviation
Magnetic Amplifiers Inc.
Magnetic Instr. Co.
Magnetic Res. Corp.
Maxson Instr. Div.
Mid-Century Instrumatic
Minneapolis-Honeywell
  Indust. Div.
Narda Corp.
Natl. Aircraft Corp
Norden-Ketay
Oster Mfg.
Pegasus Labs.
Phoenix Prec. Instr.
Radiation Inc.
Ramo-Wooldridge
Reeevs Instr. Corp.
Rheem Mfg. Co.
Rockwell Engrg. Co.
Sanborn Co.
Schaevitz Engineering
Servo Corp. of Amer.
Servomechanims, Inc.
Servonics, Inc.
Simmons Aerocessories
Std. Electronic Res.
Stator Electric
Stoelting Co.
Suffolk Products
Tarc Electronics
Texas Insts., Inc.
Timely Insts. & Consts. Co.
Transmag Div.
Transval Engrg. Corp.
Trio Labs., Inc.
Vectrol Engrg., Inc.
Vickers Electric Div.
WacLine, Inc.
Walkirt Co.
Weber Aircraft Corp.
Weighing Components

AMPLIFIERS, Vibration, see Vibration Instruments

AMPLIFIERS, Wideband

ACF Electronics
A.R.F. Products
Acton Labs.
Advance Electronics
Air Associates
Airborne Instruments Lab.
Alfred Electronics
Allied Engrg. Div.
Amer. Electronic Labs.
Amer. Mach. & Foundry
Atlantic Research Corp.
Avion Div.
Bendix Aviation Corp.
Berkeley Div.
Beva Laboratory
C.G.S. Labs.
Caltronics Corp.
Canoga Corp.
Computer Engrg. Assoc.
Deltron, Inc.
Diatron Co.
Donner Scientific
DuMont Labs., Allen B.
Electl. & Phys. Instr. Corp.
Electro-Mech. Research
Electro Products Labs.
Electronic & Engrg. Serv.
Electronic Instr. Co.
Electronic Res. Assoc.
Electro-Pulse Inc.
Electro Voice Inc.
El-Tronics Inc.
Endevco Corp.
Engrg. Research & Devel.
Epsco Inc.
F. R. Machine Works
Federal Telephone & Radio
Feiler Engrg. Co.
Furst Electronics
General Radio
Hathaway Instr. Co.
Hewlett-Packard
Indust. Test Equipt. Co.
Insts. for Industries, Inc.
Interelectronics Corp.
Internat. Telemeter Corp.
Jerrold Electronics
Kahn & Co.
Kay-Lab
Kaye Devel. Co.
Kearfott (Western)
Mag. Elect. Products
Magnetic Instr. Co.
Marconi Instruments
Mid-Century Instrumatic
Miller Instruments
Millivac Instr. Co.
Nalley Co.
National Radiac, Inc.
Neucor, Inc.
New London Instr. Co.
North Hills Electric
Photron Instr. Co.
Polarad Electronics
R. S. Electronics
Radiation Counter Labs
Radiation Instr. Dev. Lab.
Rese Engrg. Co.
Rutherford Electronics
Sanborn Co.
Scott Inc., Hermon Hosmer
Servo Corp. of Amer.
Shasta Div.
Sierra Electronic Corp.
Spencer-Kennedy
Std. Electronic Res.
Technology Instr. Div.
Tektronix, Inc.
Tel-Instr. Electronics
Tele-Dynamics, Inc.
Telechrome, Inc.
Telonic Industries
Thordarson-Meissner
Transvision, Inc.
U. S. Electronics
Varian Assocs.
Voikers & Schaeffer
Waveforms, Inc.
Weber Aircraft

ANALYTICAL INSTRUMENTS (see also Chromatography, also Defractometers, also Electroanalysis, also Electrophoresis, also Interferometers, also Oxidation-Reduction, also Spectrometers, also Titrometers, etc.)

Aero Electronics
Allied Engrg. Div.
Amer. Balance
Amer. Electronics
Amer. Instr. Co.
Applied Physics Corp.
Applied Research Labs.
Avion Div.
B & K Mfg.
Bacharach Industrial Instr.
Baird Assocs.-Atomic Instr.
Beckman Div.
Bendix-Friez
Beva Laboratory
Boonton Radio
Bristol Co.
Bush Assocs.
Cambridge Instr. Co.
Carroll Co.
Central Scientific
Coleman Electric
Consol. Electrodynamics
Davis Instr. Co.
Dietert Co.
Dorber Co.
Edin Electronics
Epsco, Inc.
Ercona Corp.
Esterline-Angus
Farnsworth Electronics
Fielden Instr. Div.
Fisher Scientific
Foxboro Co.
GE, Apparatus Sales
GE, X-Ray Corp.
General Electronic
Goodyear Aircraft
Gow-Mac Instr. Co.
Hallkainen Instruments
Hogan Labs.
Hycon Mfg.
Industrial Control Co.
Industrial Insts. Inc.
Instrument Devel. Labs.
Instrument Engrg. Serv.
International Instr. Co.
Jarrell-Ash
Kaye Devel. Co.
Laboratory Equipt. Corp.
Leeds & Northrup
Macbeth Corp.
Machlett & Son
Menlo Research Lab.
Mine Safety Appliances
Natl. Spectrographic Sales
North Amer. Philips
Nuclear Research
Ohmart Corp.
Patwin Instruments Div.
Perkin-Elmer
Phoenix Prec. Instr.
Podbielniak, Inc.
Precise Measmts. Co.
Precision Scientific
Process & Instruments
Q O S Corp.
Radio Frequency Labs.
Res. Specialties
Rowe Engrg. Co.
Roy Co., Milton
Rubicon Co.
Sargent & Co.
Scientific Glass App.
Sensitive Res. Instr.
Servo Corp. of Amer.
Taller & Cooper
Testing Machines, Inc.
Thermco Labs.
U. S. Testing Co.
WacLine, Inc.
Weston Electcl. Instr.

ANALYZERS, Chemical Composition, see Analytical Instruments

ANALYZERS, Circuit Breaker, see Circuit Breaker Analyzers

ANALYZERS, Electric Wave, see Spectrum Analyzers

ANALYZERS, Electronic Circuit, see Circuit Testers

ANALYZERS, Flight, see Navigation Aids

ANALYZERS, Gas, see Gas Analyzers

ANALYZERS, Ignition System, see Engine Test Instruments

ANALYZERS, Industrial Circuit, see Circuit Analyzers, Industrial

ANALYZERS, Industrial Power, see Electric Powe

ANALYZERS, Infrared, see Analytical Instruments, also Spectrometers

ANALYZERS, Nitric Oxide, see Gas Analyzers

ANALYZERS, Oxygen, see Gas Analyzers

ANALYZERS, Radio Set, see Circuit Testers

ANALYZERS, Sound, see Sound

ANALYZERS, Spectrum see Spectrum Analyzers

ANEMOMETERS, Hot-wire

Aero Research Instr. Co.
Airflo Instr. Co.
Atlantic Research Corp.
Bendix-Friez
Bristol Engrg. Corp.
Flow Corp.
Hastings-Raydist
Hill & Co.
Gilmore Industries
Illinois Testing Labs.
Instruments Corp.
SCAM Instr. Corp.
Serdex, Inc.
Victory Engrg. Corp.
Willson Products

ANEMOMETERS, Mechanical

Allna Corp.
Amer. Instr. Co.
Bacharach Industrial Instr.
Beckman & Whitley
Bendix, Eclipse-Pioneer
Bendix-Friez
Dietzgen Co.,
Flight Research Engrg.
Geophysical Instr. Co.
Georator Corp.
Gray Instr. Co.
Green, Henry J.
Gurley, W. & L. E.
Hill & Co.
Illinois Testing Labs.
Instruments Corp.
Kahl Scientific Instr.
Keuffel & Esser
Mine Safety Appliances
Mico Instr. Co.
North Amer. Instr.
Revere Corp.
Rieker Instr. Co.
Spence Engrg. Co.
Std. Science Supply
Stewart, M. C.
Taylor Instr. Cos.
Thermometer Corp.
Wallace & Tiernan
Waugh Engrg. Co.
Westberg Mfg.
Willson Products

ANGULAR MOMENTUM DEMONSTRATOR

Eastern Science Co.
Edcliff Instruments
Mico Instr. Co.
Sorenson & Co.

ANNUNCIATORS, see Monitors

ANTENNAS

Airborne Instruments Lab.
Aircraft Radio Corp.
Airtron, Inc.
Amerac, Inc.
Amer. Electroneering
Amer. Electronics Labs.
Amer. Elite, Inc.
Amphenol Electronics
Avion Div.
Bellmore Gear Corp.
Canoga Corp.
Coaxial Connector Co.
Collins Radio
Commercial Products Div.
Cornell-Dubilier
Craig Systems
Dale Products
DeMornay-Bonardi
Dittmore & Freimuth

Electron-Radar Prods.
Electron. Spec. Co.
Electrosonic Engrg Co.
Emerson & Cuming
Engrg. & Res. Corp.
F. R. Machine Works
Farnsworth Electronics
Fecker, Inc.
Fretco, Inc.
Goodyear Aircraft
Hewlett-Packard
Hycon Mfg.
JFD Mfg.
Jackson Co., Byron
Johnson Co., E. F.
Kay Electric
Kearfott (Western)
Lear, Inc.
Microwave Assocs.
Narda Corp.
Natl. Aircraft Corp.
Nems-Clarke
Nuclear Corp. of Amer.
Polarad Electronics
Polytechnic Res. & Devel.
Raytheon Mfg.
Sperry Gyroscope
Sperry Products
Sterling Prec. Instr. Corp.
Suffolk Products
Sylvania Electric Prods.
Technicraft Labs., Inc.
Tele-Dynamics, Inc.
Transval Engrg. Co.
Virginia Electronics
WacLine, Inc.
Weber Aircraft Corp.
Western Gear Corp.

APPARATUS, Laboratory, see Laboratory Apparatus and Supplies

APPARATUS, Laboratory, Fused Quartz, see Laboratory Apparatus

APPARATUS, Labcratory, Glass, see Laboratory Apparatus

APPARATUS, Vacuum, see Vacuum Apparatus

AREA METERS, see Flowmeters, Area

ARTIFICIAL HORIZONS, see Aircraft Instruments

ASPHALT TESTING APPARATUS, including Penetration Needles

Alpha Instr. Co.
Amer. Instr. Co.
Ann Arbor Instr. Works
Atlas Electric Devices
Blue M Electric
Bowen & Co.
Central Scientific
Chatillon & Sons
Custom Scientific Instr.
Dillon & Co.
Exact Weight Scale
Fish-Schurman
Fisher Scientific
Humboldt Mfg.
Koehler Instr. Co.
Kruger Instruments
Labline, Inc.
Olsen Testing Mach.
Permo, Inc.
Phila. Thermometer Co.
Precision Scientific
Riehle Test. Mach. Div.
Scott Testers, Inc.
Soiltest, Inc.
Technical Equipt. Co.
Tell-Tronics Prod.
Testing Machines, Inc.
Thwing-Albert
Van Keuren Co.
Victory Engrg. Corp.

ASSEMBLIES, Instrument

A & M Tool & Die
Abrams Instr. Corp.
Accurate Spring Mfg.
Aerolite Eletctronics
Aeromarine Instr. Co.
Aerovox Corp.
Ahrendt Instr. Co.
Alina Corp.
Allied Prods. Div.
Amer. Electronics
Amer. Instr. Co.
Amer. Kloeckner-Moeller
Anderson Co.
Assembly Products
Barbour Stockwell
Bausch & Lomb
Bayside Watch Tool Co.
Bellmore Gear Corp.
Bendix, Eclipse-Pioneer
Bendix, Pioneer-Central
Boonton Radio
Bristol Co.
Buhl Optical
Burlington Instr.
Century Geophysical
Chicago Indust. Instr.
Colvin Labs.
Daven Co.
Dittmore & Freimuth
Dome Precision Corp.
Eastern Specialty Co.
Eby, Inc., Hugh H.
Edin Co.
Electric Design & Mfg.
Electric Tachometer Corp.
Electro-Chemical Engrg.
Electro-Mech. Div.
Electronics, Inc.
Empire State Labs.
Engis Equipt. Co.
Engrg. & Res. Corp.
ESCO Prods. Co.
Esterline-Angus
Etched Prods. Corp.
Farnsworth Electronics
Farrand Optical
Fecker, Inc.
Ferner Co.
Fisher & Porter Co.
Ford Instr. Co.
Fulton-Sylphon Div.
Gadgets, Inc.
Gaertner Scientific
GE
General Industries Co.
Genisco Inc.
Geophysical Instr. Div.
Gervos Instruments
Giannini & Co.
Grammes Sons
Hairspring Vibrating Co.
Hall-Barkan Insts.
Hamilton Tool Co.
Hamilton Watch
Haydon Mfg.
Howard Clock
Ideal-Aerosmith
Illinois Testing Labs.
Insco Company
Instru-Lec Corp.
Instrument Corp.
Instrument Develop. Labs.
Instr. Devel. & Mfg. Corp.
Instrument Gear Works
Instrument Products
Instruments Inc.
Insuline Corp. of Amer.
Intercontinental Dynamics
J-B-T Instruments
Jensen Tool Co., H. C.
Jordan Electronics
Kollsman Instr. Corp.
Lake Erie Electric
Lewyt Corp.
Librascope, Inc.
Magnavox Co.
Mann Co., Wm. I.
Meyer-Opticraft
Molded Insulation Co.
Moss & Co.
New Haven Clock
Peschel Electronics
Phaostron Co.
Phoenix Prec. Instr.
Plumb Co.
Potter Instr. Co.
QOS Corp.
Ram Meter, Inc.
Schneider-Cogswell
Scovill Mfg.
Seth Thomas Clocks
Shallcross Mfg.
Shand & Jurs
Smith Mach. Co., H. A.
Specialties, Inc.
Std. Automation Prods.
Standard Electric Time
Stoelting Co.
Swiss Amer. Jewel-Bear.
Swissomatic Products
Tarc Electronics Inc.
Technical Soldering Co.
Teletronics Lab., Inc.
Tell-Tronics Prods.
Thompson Clock
Thwing-Albert
Tinsley Laboratories
Tri-Dex Electronics
United States Instr. Corp.
Universal X-Ray Prods.
Vectron, Inc.
WacLine, Inc.
Wadsworth Watch Case
Waterman Products
Wilder, Inc.
Winslow Co., Inc.
Zenith Electric
Zenith Optical Co.

ASSEMBLY MACHINES, Automatic, see Machines, Automatic Circuit Assembly

ASTRONOMICAL INSTRUMENTS

Askania-Werke A. G.
Avion Div.
Bausch & Lomb
Bendix, Eclipse-Pioneer
Berger & Sons
Bushnell Optical
Clark & Sons
Davidson Mfg. Co.
F & W Optical
Eastern Science Co.
Edmund Scientific
Ercona Corp.
Esco Prods. Co.
Fecker, Inc.
Fish-Schurman
Gaertner Scientific
Gordon Enterprises
Griswold Mfg.
Gurley, W. & L. E.
Hall-Barkan
Henson Co.
Kollsman Instr. Corp.
Lab. Optical
Lenox Instr. Co.
Mann Co., Wm. I.
Mico Instr. Co.
Opplem Co., Inc.
Palos Optical
Pan-Technics, Ltd.
Perkin-Elmer
Taylor Instr. Cos.
Tinsley Labs.
Tork Clock Co.
Unertl Optical
Warren-Knight
Waveforms, Inc.
White Co., Inc., David
Wild Heerbrugg
Zeiss, Inc., Carl

ATTENUATORS

Acton Labs.
Aerovox Corp.
Airborne Instruments Lab.
Amerac, Inc.
Audio Instr. Co.
Automatic Elect. Chicago
Bellmore Gear Corp.
Boonton Radio
British Electronic Sales

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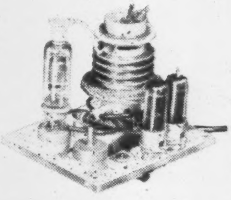
MODEL LAB—60 RF Type Continuously Variable 0-60 KV DC Regulated Power Supply

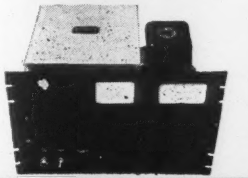
Current output 1 ma. at 60 KV. 2 ma. may be drawn from 50 KV to 0. Supplied with either positive polarity or negative polarity output.

LAB-60 Complete with meter ....**$695 Net**
LAB-60 PN Reversible polarity model of above ....**$745 Net**

MODEL 4575 4½ KV POWER SUPPLY



This compact, well designed, ruggedly built DC supply utilizes two 6AQ5 tubes as a parallel oscillator feeding a 1X2 rectifier tube. For an output voltage of 4½ KV DC at 1 milliampere, the low voltage input requirement is 250 V at 50 milliamperes. By varying the DC input the output voltage can be varied from aprox. 1 KV to 7½ KV. Dimensions: 5⅝" high x 5" deep x 4¼" wide. In completely enclosed metal housing (not shown). Less low voltage DC supply **$62.50 Net**



MODEL RG-30 • Continuously Variable 15-30 KV Regulated DC Power Supply

A high grade supply which incorporates a regulated high voltage tap in the range of 4 to 6 KV for use with 5WP15, 5TP4 and flying spot tubes. Regulations better than .5% at 1 milliampere. In wide use for color tube development work, transcription recording systems . . . **$295 Net** With meter installed on front panel ....**$50 Additional**

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3029 WEBSTER AVENUE
N. Y. 67, N. Y.
Kingsbridge 7-0306

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Centralab Div.
Cinema Engrg. Co.
Clarke Instr. Co.
Clarostat Mfg.
Coaxial Connector Co.
Computer Co. of Amer.
Corning Glass Works
Daven Co.
DeMornay-Bonardi
Diamond Mfg. Corp.
Diamond Microwave Corp
Dittmore & Freimuth
Electcl. & Phys. Instr.
Electro Products Lab.
Electro-Pulse, Inc.
Electron-Radar Prods.
Electronic Assocs.
Electronic & Engrg. Serv.
Emerson & Cuming
Empire Devices
Empire State Labs.
F. R. Machine Works
Farnsworth Electronics
Federal Telephone & Radio
Feiler Engrg. Co.
Gadgets, Inc.
General Radio
Geotechnical Corp.
Harvey Radio Labs.
Hewlett-Packard
Hickok Electcl. Instr.
Hycon Mfg. Co.
Hycor Div.
International Resistance
Internat. Telemeter Corp.
Kay Electric
Kay-Lab.
Kearfott (Western)
Kearfott Co.
Leeds & Northrup
Mallory & Co., P. R.
Magnetic Instr. Co.
Marconi Instruments
Measurements Corp.
Metavac, Inc.
Micromat Co.
Microphase Corp.
Mid-Century Instrumatic
Narda Corp.
Norden-Ketay
Ohmite Mfg.
Polaroid Corp.
Polytechnic Res. & Devel.
RHO Engrg. Co.
RCA Div.
Reiner Electronics
Rutherford Electronics
Sanders Assocs.
Scott Inc., Hermon Hosmer
Servo Corp. of Amer.
Servomechanisms, Inc.
Shallcross Mfg.
Sherron Metallic Corp.
Sound Apparatus Co.
Sperry Gyroscope
Stoddart Aircraft Radio
Technicraft Labs.
Thordarson-Meissner
Trad Electronics Corp.
Trimount Instr. Co.
Vectron, Inc.
Virginia Electronics
WacLine, Inc.
Weinschel Engrg. Co.

AUDIO-FREQUENCY EQUIPMENT (see also Amplifiers)

Aero Electronics Co.
Aerovox Corp.
Airdesign, Inc.
Air-O-Tronics
Alcor Electronics Corp.
Allied Radio Corp.
Altec Lansing Corp.
Alto Scientific
Amer. Electronic Labs.
Ampex Corp.
Amplifier Co.
Assembly Products
Audio Devel. Instr. Co.
Audio Instrument
Authorized Mfrs. Serv.
Baird Assocs.-Atomic Instr.
Ballantine Labs.
Beam Instr. Co.
Bell Sound Systems
Bendix, Eclipse-Pioneer
Berkeley Scientific
Berndt-Bach
Boonton Radio
Browning Labs.
Brush Electronics
Century Geophysical
Cinema Engrg. Co.
Clark Radio Equipt.
Clarke Instr. Corp.
Clough-Brengle
Collins Radio
Commercial Research Div.
Computer Co. of Amer.
Computer Engrg. Assoc.
Daven Co.
Davenport Mfg.
Deltron, Inc.
Dittmore & Freimuth
Donner Scientific
DuMont Labs., Allen B.
Dyna-Empire
Edin Electronics
El Mac Labs.
Electro-Devices, Inc.
Electro-Mech. Research
Electro-Medical Lab.
Electro Voice, Inc.
Electronic & Engrg. Serv.
Electro Products Lab.
Electronic Devel. Lab.
Electronic Instr. Co., Inc.
Electronic Prods. Co.
El-Tronics, Inc.
Empire Devices
Engineering Res. & Devel.
Erdco Engrg.
Erwood, Inc.
Fairchild Camera
Farnsworth Electronics
Federal Telephone & Radio
Feiler Engrg. Co.
Femco, Inc.
Ferranti Electric
Freed Transf. Co
Furst Electronics
GE
General Mills
General Radio
Georator Corp.
Globe Phone Mfg.
Hathaway Instr., Co.
Harvey Radio Labs.
Heiland Div.
Hewlett-Packard
Hickok Electcl. Instr. Co.
Hycor Div.
Indust. Test Equipt. Co.
Interelectronics Corp.
Jackson Elect. Instr.
Kahn & Co.
Kay Electric
Kay-Lab
Kaye Devel.
L & O Res. & Devel. Co.
Lab. of Electronic Engrg.
Lab-Tronics
Langevin Mfg. Corp.
Lear, Inc.
Lewyt Metal Prods.
Magnecord, Inc.
Magnetic Instr. Co.
Marconi Instruments
Martin-Hubbard
Massa Labs
McFarlin Co.
Measurements Corp.
Metron Instr. Co.
Millen Mfg.
Natl. Aircraft Corp.
National Co. Inc.
New London Instr. Co.
Pacific Instr. Co.
Pacific Transducer Corp.
Philamon Labs.
Polarad Electronics
Premier Crystal Labs
Radio Receptor Co.
Rauland-Borg
Raytheon Mfg.
RCA Div.
Reiner Electronics
Scott, Inc., Hermon Hosmer
Sensitive Res. Instr.
Shallcross Mfg.
Sherron Metallic Corp.
Sound Apparatus
Southw. Ind. Electronics
Std. Transf. Corp.
Sunshine Scientific
Sylvania Elect. Prods.
Technology Instr. Div.
Technomatic Instr. Co.
Teletronics Lab., Inc.
Televisio Co.
Thordarson-Meissner
Triumph Mfg.
United Transf. Corp.
Vectron, Inc.
Virginia Electronics
Waveforms, Inc.
Weber Aircraft Corp.
Westinghouse Electric
Westport Electric
Wiancko Engrg. Co.

AUDIO-FREQUENCY OSCILLATORS, see Oscillators, Audio-Frequency

AUDIOMETERS

Aerovox Corp.
Erwood, Inc.
Interelectronics Corp.
Lab. of Electronic Engrg.
Magnetic Instr. Co.
Marconi Instruments
Metrotype Corp.
Scott, Inc., Hermon Hosmer
Shallcross Mfg.
Stoelting Co.

AUTOCLAVES, High-Pressure

Aetna Scientific
Amer. Instr. Co.
Autoclave Engrs.
Barnstead Still
Central Scientific
Emerson App. Co.
High Pressure Equipt. Co.
Industrial Process Engrg.
Lennard Co.
Parr Instr. Co.
Precision Scientific
Pressure Prods. Industries
Quaid Fabricators
Ruska Instr. Corp.
Will Corp.

AUTO-COLLIMATORS

Acme Industrial
Alfa Amer. Corp.
Align-A-Scope, Inc.
Amer. Instr. Co.
Bray Optical
Bronoptics Co.
Clark & Sons
Davidson Mfg.
Dusenbery Co.
Engis Equipt. Co.
Ercona Corp.
Farrand Optical
Fecker, Inc.
Fish-Schurman
Gaertner Scientific
Georator Corp.
Gordon Enterprises
Griswold Mfg.
Gurley, W. & L. E.
Henson Co.
Jarrell-Ash
Kollmorgen Optical
Lab. Optical
Lindly & Co.
Los Angeles Scientific
Mann Co., Wm. I.

BAROMETERS

. . . original designer and manufacturer of the Fortin type.

. . . models for

OBSERVATORIES (Standard and Mountain)

MARINE USES

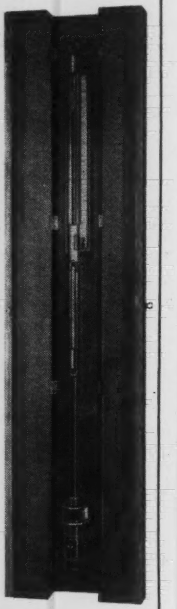
ALTIMETER TESTING

OLD-ENGLISH-STYLE (house-type)

ANEROID (Weather and Altitude)

SELF-RECORDING

BAROGRAPHS



Henry J. Green

Established 1832

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For more information circle **70** on inquiry card.

Light Weight

MICRO

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Offered in two models.

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Los Angeles 15, Calif.

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Meyer-Opticraft
Optical Service & Devel.
Palos Optical
Pan-technics, Ltd.
Parr Instr. Co.
Penn Optical & Instr.
Perkin-Elmer
QOS Corp.
Testa Mfg. Co.
Unertl Optical
Zeiss, Inc., Carl
Zoomar Corp.

AUTOMOTIVE SERVICE INSTRUMENTS, see Engine Test Instruments

AUTOTRANSFORMERS, see Transformers, Variable

AVIATION Airborne, see Aircraft Instruments

AVIATION INSTRUMENTS, Ground

Aero Electronics
Amer. Electronics
Assembly Products
Bendix Aviation Corp.
Boonton Radio
Colvin Labs.
Electro Instr., Inc.
Engrg. & Res. Corp.
Farnsworth Electronics
Gadgets, Inc.
I-L-S Instr. Corp.
Kollsman Instr. Corp.
Lewis Engrg. Co.
Narda Corp.
Radio Receptor Co.
Robertshaw-Fulton, Aeron.
WacLine, Inc.
Waugh Engrg. Co.

AXLE TESTERS

Eitzen Co., Louis C.
Olsen Testing Machine
Riehle Div.
Sperry Products

AZIMUTH INSTRUMENTS, see Navigation Aids

BALANCES (see also the Object of Measurement and Control)

Central Scientific
Detecto Scales
Dietert Co.
Fisher Scientific
Heusser Instr. Mfg.
Metrogram Corp.
Seederer-Kohlbusch
Testing Machines, Inc.
Troemner, Henry
Voland & Sons, Inc.
Welch Mfg. Co., W. M.

BALANCES, Analytical and Precision for Weights and Measures

Ace Glass
Ainsworth & Sons
Amer. Balance
Arga Div.
Baird Assocs.-Atomic Instr.
Becker Div., Christian
Brinkmann Instruments
Burke & James
Burrell Corp.
Cady & Co.
Central Scientific
Chatillon & Sons
Chicago App. Co.
Coleman Instr.
Detecto Scales, Inc.
Dietert Co.
Exact Weight Scale Co.
Fisher Scientific
Franklin Electronics
Gurley, W. & L. E
Hadley Assocs.
Heusser Instr. Mfg.
Indust. Scientific Inc.
Jarrell-Ash
Kent Cliff Labs.
Metrogram Corp.
Microchemical Service
National Instr. Co.
Ohaus Scale
Opplem Co.
Pfaltz & Bauer
Physics Research Labs.
Roller-Smith
Schaar & Co.
Scientific Balance
Seedburo Equipt. Co.
Seederer-Kohlbusch
Streeter-Amet
Taller & Cooper
Testing Machines, Inc.
Thomas Co., Arthur H.
Thompson Balance
Torsion Balance
Troemner, Henry
Voland & Sons
Welch Mfg. Co., W. M.
Will Corp.

BALANCES, Automatic Recording

Amer. Balance
Avion Div.
Brinkmann Instruments
Burrell Corp.
Detecto Scales
Engineering Res. & Devel.
Exact Weight Scale
Fielden Instr. Div.
Franklin Electronics
Gilmore Industries
Hadley Assocs.
Ideal-Aerosmith
Indust. Electronics Engrs.
Indust. Scientific
Kent Cliff Labs.
Metrogram Corp.
Nalley Co.
Phoenix Prec. Instr.
Roller-Smith
Seederer-Kohlbusch
Streeter-Amet
Taller & Cooper
Thayer Scale & Engrg.
Voland & Sons
Will Corp.

BALANCES, Gas Density and Specific Gravity (see also Specific Gravity)

Amer. Balance
Baird Assocs.-Atomic Instr.
Becker Div., Christian
Beckman, Inc., Arnold O.
Brinkmann Instruments
Burrell Corp.
Central Scientific
Chicago App. Co.
Eberbach & Son Co.
Electrical Devel.
Exact Weight Scale
Fisher Scientific
Hadley Assocs.
Hagan Corp.
Heusser Instr. Co.
Humboldt Mfg.
Indust. Scientific, Inc.
Kent Cliff Labs., Div.
Ohaus Scale
Pfaltz & Bauer
Refinery Supply
Roller-Smith
Seederer-Kohlbusch
Std. Science Supply
Toledo Scale
Torsion Balance
Troemner Henry
Welch Mfg. Co., W. M.
Will Corp.

BALANCES, Hydrostatic

Amer. Balance
Central Scientific
Chicago App. Co.
Seederer-Kohlbusch
Welch Mfg. Co., W. M.

BALANCES, Magnetic

Allied Products Div.
Exact Weight Scale
Georator Corp.
Instrument Lab., Inc.
Seederer-Kohlbusch
Voland & Sons
Will Corp.

BALANCES, Magnetic (Geophysical)

Allied Products Div.
Askania-Werke, A. G.
Century Geophysical
Edin Electronics
Geophysical Instrument
Georator Corp.
Ruska Instr. Corp.

BALANCES, Micro

Ainsworth & Sons
Amer. Balance
Becker Div., Christian
Brinkmann Instruments
Burrell Corp.
Cady & Co.
Can. Rad. & Uran.
Central Scientific
Exact Weight Scale
Franklin Electronics
Heusser Instr. Mfg.
Indust. Scientific Inc.
Jarrell-Ash
Kent Cliff Labs., Div.
Microchemical Service
Opplem Co.
Pfaltz & Bauer
Scientific Balance
Seederer-Kohlbusch
Thomas Co., Arthur H.
Torsion Balance Co.
Voland & Sons
Will Corp.

BALANCES, Surface Tension

Amer. Balance
Brinkmann Instruments
Central Scientific
Chatillon & Sons
Exact Weight Scale
Indust. Scientific
Kent Cliff Labs.
Roller-Smith
Seederer-Kohlbusch
Torsion Balance Co.
Welch Mfg. Co., W. M.
Will Corp.

BALANCES, Westphal

Amer. Balance
Becker Div., Christian
Central Scientific
Chicago App. Co.
Fisher Scientific
Indust. Scientific
Kent Cliff Labs.
Pfaltz & Bauer
Torsion Balance Co.
Seederer-Kohlbusch
Troemner, Henry
Welch Mfg. Co., W. M.
Will Corp.

BALANCING MACHINES, Dynamic

Aero Electronics
Annis Co.
Bear Mfg. Co.
Cosa Corp.
Decker Aviation Corp.
DoAll Co.
Electronic Corp.
Exact Weight Scale
Ferner Co.
GE, Apparatus Sales
Gisholt Mach. Co.
Globe Tool & Engrg.
Hickok Electcl. Instr.
Instr. Assocs.
Internat. Res. & Devel.
Kahn & Co.
Micro Balancing, Inc.
Minnesota Electronics
Olsen Testing Machine
Orban Co., Kurt
Pacific Scientific
Raydyne Corp.
Ten Bosch Inc.
Westinghouse Electric

BALANCING MACHINES, Static

Anderson Bros.
Annis Co.
Best Mfg.
Chatillon Sons
Cosa Corp.
Crown Indust. Prods.
Exact Weight Scale
Ferner Co.
Gisholt Machine
Gelber Co.
Globe Tool & Devel.
Industrial Electronics
Micro-Poise Engrg.
Olsen Testing Machine
Pacific Scientific
Raydyne Corp.
Sundstrand Mach. Tool Co.
Taylor Dynamometer
Toledo Scale

BALLAST TUBES, see Current Regulators

BALLISTIC INSTRUMENTS, Crime Detection, see Criminology Lab. Apparatus

BALLISTIC INSTRUMENTS, Electrical

ACF Electronics
Atlantic Research Corp.
Berkeley Div.
Cal-Tronics Corp.
Cambridge Instr. Co.
Chesapeake Instr. Co.
Control Devices Inc.
Detectron Co.
Epsco, Inc.
Farnsworth Electronics
Fecker, Inc.
Feedback Controls
GE
Gulton Mfg.
Hickok Electcl. Instr.
Jacobs Instr. Co.
Kay Electric
Leeds & Northrup
Micro Balancing, Inc.
Potter Instr. Co.
Prec. Thermom. & Insts.
Radiation Res. Corp.
Rawson Electrical Instr.
Rubicon Co.
Sensitive Research Instr.
Topp Industries
Triplett Electcl. Inst.
Walkirt Co.
Westinghouse Electric
Wiancko Engrg. Co.

BALLISTIC INSTRUMENTS, Ordnance, see Ordnance

BALLS, Bronze, Monel, etc.

Allmetal Screw Products
Burlington Istr.
GE, Metall. Prods. Dept.
Hartford Steel Ball
Indust. Tectonics
PIC Design Corp.
Schnitzer Alloy Prods.

BALLS, Glass

Bache & Company, Semon
Can. Rad. & Uran.
Edna Lite Optical Co.
Fish-Schurman
Geophysical Instr. Co.
Hartford Steel Ball Co.
Herron Optical
Industrial Techtonics
Jones Optical
Mann Co., Wm. I.
Owens-Illinois
Phoenix Prec. Instr.
Popper & Klein
Prec. Glass Prods.
Regal Instr. Co.

BALLS, Sapphire

Amer. Laubscher
Bird & Co.
Elgin Natl. Watch
Gallien, R. P.
Imetra Co., Ltd.
Indust. Techtonics
Instrument Products
Jones Optical
Keller & Co.
Linde Air Products
Mann Co., Wm. I.
Swiss Amer. Jewel Bear.
Vallorbs Jewel Co.
Worley Jewel Co.

BALLS, Stainless Steel and/or Steel, Polished (0.5mm min. dia.)

Albany Prods. Co.
Anti-Corrosive Metal Prods.
Beamco, Inc.
Eastern Specialty Co.
Eitzen Co., Louis C.
Fafnir Bearing
GE
Harris & Co.
Hartford Steel Ball
Indust. Tectonics
Landis & Gyr
New Departure Div.
N. H. Ball Bearing
Norma-Hoffman
PIC Design Corp.
Schnitzer Alloy Prods.
Swiss Jewel Co.

BALSAM

Aerovox Corp.
Bausch & Lomb

BANK and TURN INDICATORS, see Aircraft Instruments

BANK and TURN INDICATOR TESTERS, see Aircraft Instrument Testers

BAROGRAPHS, see Barometers, Recording

BAROMETERS, Altitude

AiResearch Mfg. Co.
Aeromarine Instr. Co.
Amer. Paulin
Askania-Werke, A. G.
Bendix, Eclipse-Pioneer
Bendix-Friez
Bowen & Co.
Bruning Co.
Dietzgen Co.
General Mills Inc.
Germanow-Simon
Giannini & Co.
Green, Henry J.
H & H Thermostats
Hass Bros.
Ideal-Aerosmith
Ideal Lab. Tool
Indust. Scientific
Instr. Assocs.
Instruments Corp.
Keuffel & Esser
Kollsman Instr. Div.
Matisa Equipt. Co.
Meriam Instr. Co.
Mine Safety Appliances
Norden Instr. Co.
Opplem Co.
Panoramic Radio
Post Co.
Prec. Thermom. & Insts.
RCA Div.
Scope Instr. Co.
Sperry-Sun Well Surveying
Square D Co.
Stratex Instr. Co.
Taylor Instr. Cos.
Technicraft Engrg. Co.
Thermometer Corp.
Thwing-Albert
Uehling Instr. Co.
Wallace & Tiernan
Warren Knight
Welch Mfg. Co., W. M.
Westinghouse Electric
White Co.
Wiancko Engrg. Co.

BAROMETERS, Aneroid

Aeromarine Instr. Co.
Amer. Paulin
Bacharach Indust. Instr.
Bendix, Eclipse-Pioneer
Bendix-Freiz
Central Scientific
Chelsea Clock
Dietzgen Co.
Fisher Scientific
Germanow-Simon
Green, Henry J.
Ideal Lab. Tool
Indust. Scientific
Instruments Corp.
Keuffel & Esser
Kollsman Instr. Corp.
Mine Safety Appliances
Negus, T. S. & J. D.
Post Co.
Scientific Instr. Co.
Scope Instr. Corp.
Seegers Mfg.
Serdex, Inc.
Square D Co.
Standard Thermometer Inc.
Stewart, M. C.
Swift & Anderson
Taylor Instr. Cos.
Testrite Instr. Co.
Thermometer Corp.
Wallace & Tiernan
Warren Knight
Welch Mfg. Co., W. M.
White Co.

BAROMETERS, Mercurial

Alpha Instr. Co.
Amer. Paulin
Bendix, Eclipse-Pioneer
Bendix-Friez
Builders-Providence
Central Scientific
Chicago Apparatus Co.
Dietert Co.
Eberbach & Sons
Fish-Schurman
Fisher Scientific
Gaertner Scientific
Green, Henry J.
Greiner Glassblowing Lab.
Hass Bros.
Hiergesell, Wm. & Sons
Ideal-Aerosmith
Ideal Lab. Tool
Indust. Scientific
Instruments Corp.
Kessler Co.
Kollsman Instr. Div.
Manning, Maxwell & Moore
Meriam Instr. Co.
Moeller Instr. Co.

Negus, T. S. & J. B.
Prec. Thermom. & Insts.
Refinery Supply Co.
Sargent & Co.
Scientific Glass App.
Scientific Instr. Co.
Specialty Glass Co.
Standard Science Supp.
Stoelting Co.
Taylor Instr. Cos.
Thermometer Corp.
Trimount Instr. Co.
Uehling Instr. Co.
Universal X-Ray Prods.
Wallace & Tiernan
Weksler Thermom. Corp.
Welch Mfg. Co., W. M.
Weston Electcl. Instr.

BAROMETERS, Recording

Alden Products
Alfax Paper & Engrg.
Amer. Paulin
Askania-Werke A. G.
Bacharach Indust. Instr.
Bendix-Friez
Bristol Co.
Dickson Co.
Dietzgen Co.
Foxboro Co.
Geotechnical Corp.
Green, Henry J.
H & H Thermostats
Hathaway Instr. Co.
Ideal-Aerosmith
Ideal Lab. Tool
Impact Register Co.
Indust. Scientific
Instruments Corp.
Keuffel & Esser
Minneapolis-Honeywell
Moeller Instr. Co.
Penn Insts. Div.
Phoenix Prec. Instr.
Scientific Instr. Co.
Serdex, Inc.
Taylor Instr. Cos.
Uehling Instr. Co.
United Scientific

BAROMETERS, Station

Amer. Paulin
Bendix-Friez
Green, Henry J.
Ideal-Aerosmith
Ideal Lab. Tool
Instruments Corp.
Kollsman Instr. Corp.
Manning, Maxwell & Moore
Moeller Instr. Co.
Rec. Thermom. & Insts.
Seegers Mfg.
Square D Co.
Taylor Instr. Cos.
Universal X-Ray Prods.
Wallace & Tiernan

BAROMETRIC PRESSURE RECORDERS, see Barometers, Recording

BATHS, Calibration and Testing, including Water and Oil (see also Temperature Calibration)

Ace Glass
Amer. Instr. Co.
Amer. Research Inc.
Barnstead Still & Ster. Co.
Bayley Instr. Co.
Blue M Electric
Bowser Inc.
Chicago App. Co.
Coleman Instr. Co.
Electric Hotpack
Fish-Schurman
Fisher Scientific
Hallikainen Instruments
Ideal. Lab. Tool
Indust. Scientific
Kahn & Co.
Koehler Instr. Co.
Labline Inc.
Modern Lab. Equipt. Co.
Murphy & Miller
Precision Scientific
Process & Instruments
Res. Appl. Co.
Research Specialties
Ruska Instr. Corp.
Standard Cabinet Co.
Std. Electronic Res.
Tenney Engrg. Co.
Temp. Engrg. Corp.
Victory Engrg. Corp.
Yellow Springs Instr. Co.

BATTERIES, Dry

Allied Engrg. Div.
Burgess Battery
Edison, Inc., T. A.
Interelectronics Corp.
Kellogg Switchboard
Linde Air Products
Magnavox Co.
Mallory & Co., P. R.
Marathon Battery
National Carbon
Philco Corp.
RCA Tube
Specialty Battery
Walker-Jamieson

BATTERIES, Mercury

Interelectronics Corp.
Linde Air Products
Mallory, Battery Div.
National Carbon
RCA Tube

BATTERIES, Radioactive

Nuclear Corp. of Amer.
Radiation Res. Corp.
Tracerlab Inc.
U. S. Radium

BATTERIES, Solar

Internat. Rectifier Corp.
Texas Insts., Inc.

BATTERIES, Storage

Amer. Hard Rubber
Baker & Co.
Edison, Inc., T. A.
Goodyear Tire
Interelectronics Corp.
U. S. Rubber
Std. Elect. Time Co.
Waterbury Battery Co.
Yardney Electric

BATTERY CHARGERS

Acme Electric
Allied Engrg. Div.
Allied Radio
Amer. Electronic Labs.
Automatic Electric
Autom. Switch Co.
Bart-Messing
Bendix, Eclipse-Pioneer
Bogue Electric Mfg.
Brit. Electronic Sales
Christie Electric
Control Corp.
Cornell-Dubilier
Cutler-Hammer
Del Electronics
El Mec Labs.
Electric Heat Control
Electronic Instr. Co.
Electronic Measmts. Co.
Electrosig Corp.
Fansteel Metallurgical
Federal Telephone & Radio
Femco, Inc.
Ferranti Electric
Gates Electronic
GE, Apparatus Sales
Georator Corp.
Green Rectifier Co.
Indust. Control Panel Co.
Indust. Rectifier Devices
Inet, Inc.
Internat. Std. Trading
Kellogg Switchboard
Kepco Labs.
Knopp Inc.
LaMarche Mfg. Co.
Lectronic Research Labs.
Macarr, Inc.
Mallory & Co., P. R.
Magnetic Instr. Co.
Magnetic Research Corp.
Model Rectifier Corp.
NJE Corp.
North Electric
Opad Electric
Perkin Engrg. Co.
Radio Receptor Co.
Raytheon Mfg.
Schauer Mfg.
Sorensen & Co.
Std. Transf. Corp.
Sun Electric
Technical App. Builders
Thompson Clock
Thordarson-Meissner
Walker Div.
Ward Leonard
Westinghouse Electric

BATTERY ELIMINATORS

Allied Engrg. Div.
Assembly Products
Automatic Electric
Bart-Messing
Bogue Electric Mfg.
Brit. Electronic Sales
Consol. Engrg. Co.
Cornell-Dubilier
Electronic Instr. Co.
Electro Products Lab.
Electronic Prods. Co.
Electrosig Corp.
Empire Devices
Federal Telephone & Radio
Gates Electronic
GE
General Radio
Green Rectifier Co.
Hagan Corp.
Indust. Rectifier Devices
Interelectronics Corp.
Kellogg Switchboard
Kepco Labs.
LaMarche Mfg.
Macarr, Inc.
Magnetic Instr. Co.
Mallory & Co., P. R.
Model Rectifier
NJE Corp.
National Time & Signal
Opad Electric
Perkin Engrg. Co.
Peschel Electronics
Raytheon Mfg.
RCA Div.
Sargent & Co.
Schauer Mfg.
Sorenson & Co.
Standard Elect. Time Co.
Std. Transf. Corp.
Sun Electric Corp.
Technical App. Builders
Thordarson-Meissner
Univ. Atomics Corp.
Virginia Electronics
Walker Div.

BATTERY TESTERS

Aerotronic Assocs.
Christie Electric Co.
Chicago Industrial
Clough-Brengle
Daven Co.
Edelman & Co.
Electro-Mech. Instr.
Electronic Devel. Lab.
Electronic Instr. Co.
Erwood, Inc.
Fisher Res. Lab.
Freas Glass Works

PRECISION—MERCURIAL
BAROMETERS—MANOMETERS
AVAILABLE WITH ANY OR ALL OF THESE FEATURES:

31" Type A-1 Barometer

Conforms to Spec. Mil-B-4308

Measures Absolute or Differential Pressures

Primary Standard Barometers Available

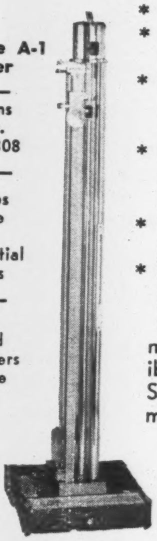
- * Range 0-31", 0-62" and 0-100 inches of mercury.
- * Complete Temperature and gravity compensation. (0-31" and 0-62" Instruments Only).
- * Direct true pressure readings with accuracy guaranteed to less than 0.25 mm mercury. (0.15 mm if calibration chart is used).
- * Manual Sighting or Photo Electric Scanner indicating pressure changes of less than 0.01 mm mercury.
- * Stop-bar mechanism for production testing at predetermined points.
- * Choice of scale graduations: inches, millimeters, millibars, altitude or special.

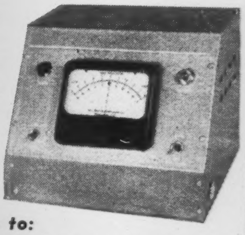
Used by the U. S. Air Force, and instrument manufacturers for the calibration of Altimeters, Air Speed Indicators, Automatic Pilots, Altitude Switches, Thrust Meters, Machmeters, etc.

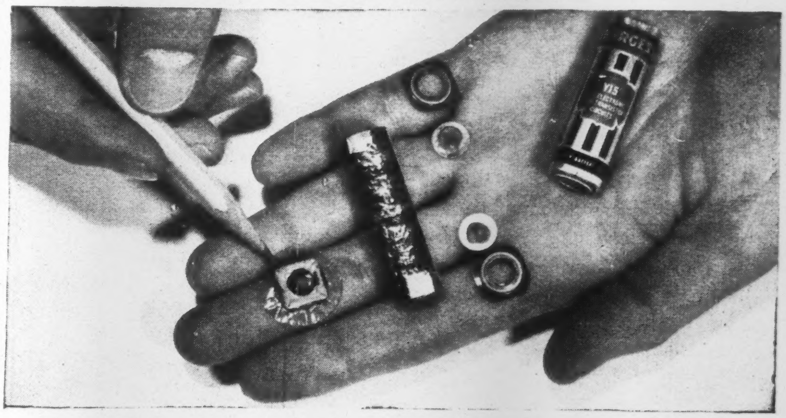
Amplifier for Photo Scanner

For more information or special application write to:
HASS BROTHERS INSTRUMENT CO.
5476 FORESTVILLE ROAD WASHINGTON 28, D. C.

For more information circle 72 on inquiry card.







REVOLUTIONARY BURGESS "WAFER-CELL" offers
SMALL, COMPACT POWER PACKAGES

A major step toward the application of automation to the manufacture of dry batteries has been achieved with the development of the new BURGESS "WAFER-CELL" making possible a 30 PER CENT INCREASE IN BATTERY LIFE.

The new cell consists of a sandwich of artificial manganese dioxide mix between tiny discs of flat zinc and carbon electrodes wrapped in pliofilm envelopes and heat sealed. A dab of SILVER WAX on the positive and negative sides of the cells permits stacking them in a column eliminating welded or soldered connections. Rigid inter-cell connections are maintained since the silver wax yields and molds itself to any necessary configuration between the cells to hold PERFECT ELECTRICAL CONTACT.

Small batteries for hearing aids, pocket radios, B-C photo guns and transistorized instruments are made by wrapping the cell stack in MYLAR FILM and packaging it in a leakproof tube of drawn aluminum.

Your local Burgess distributor carries complete stocks of fresh BURGESS BATTERIES including new "Wafer-Cell" types.

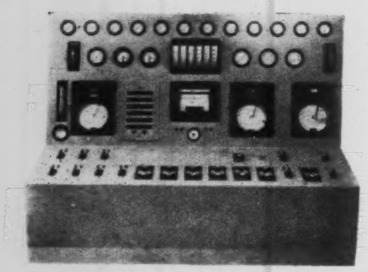
BATTERY DESIGN SERVICE AVAILABLE

The same engineering "know-how" that made possible the new "Wafer-Cells" is available TO YOU. Long before you run into a battery design problem, call on Burgess for expert battery design assistance.

BURGESS
BURGESS

BURGESS BATTERY COMPANY
FREEPORT, ILLINOIS

For more information circle 73 on inquiry card.



REPUBLIC
COMBUSTION CONTROL

Republic automatic combustion control is available for all sizes of boilers, all types of fuel firing, all load conditions and any arrangement of draft equipment.

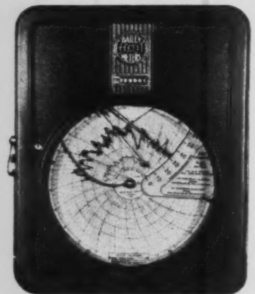
The Republic combustion control (1) automatically maintains constant steam pressure by controlling the heat input to the boilers; (2) automatically maintains highest combustion efficiency by controlling simultaneously the fuel and air input in measured proportions; (3) automatically maintains any desired load division between the boilers; (4) automatically maintains the correct constant draft in each furnace.

WRITE FOR DATA BOOK No. S-21

REPUBLIC FLOW METERS CO.
2240 Diversey Pkwy. Chicago 47, Ill.

REPUBLIC
INSTRUMENTS • CONTROLS

For more information circle 74 on inquiry card.



BAILEY BOILER METER
Steam Flow—Air Flow Ratio Meter

- This dependable and accurate guide to maximum combustion economy is easily understood and followed by operators. It indicates, records, and integrates Steam Flow from the boiler, records Air Flow supplied for combustion, and records Flue Gas Temperature.

Best combustion efficiency is secured by keeping the Steam Flow and Air Flow pens together so that the records coincide. The record of the Flue Gas Temperature when compared with that of Steam Flow shows the condition of baffles and tubes, and indicates heat absorption efficiency.

The **Bailey Boiler Meter** reduces fuel costs, lessens maintenance and outage, lowers standby costs, and adds capacity. It is suitable for boilers of 100 hp or more and for all types of fuels.

To obtain maximum benefit from the **Bailey Boiler Meter,** it should be made an integral part of a Bailey Combustion Control System so that combustion losses are automatically corrected as they tend to appear.

Request Product Specification M61-1.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For more information circle 75 on inquiry card.

GE
Griebel Co.
Helipot Div.
Hickok Electcl. Instr.
Imperial Brass
Instrument Labs.
Kimble Glass
Larson Instr. Co.
Non-Linear Systems
Opad Electric
Owens-Illinois
Prec. Thermom. & Insts.
Radio City Products
Rascher & Betzold
Rieker Instr. Co.
Simpson Electric
Sterling Mfg. Co.
Sun Electric
Sunshine Scientific
Technical App. Builders
Testrite Instr. Co.
Triplett Elect. Instr.
United Mfg. Co.
Weston Electcl. Instr.

BEAM COMPASSES, see Drawing Instruments

BEARING CIRCLES

Alpha Instr. Co.
Dusenbery Co.
Eastern Specialty Co.
Georator Corp.
Gurley, W. & L. E.
Halax Corp.
Kollmorgen Optical
Meyer-Opticraft
Negus, T. S. & J. D.
Ritchie & Son

BEARING TEMPERATURE INSTRUMENTS, including Alarms

Aero Research
Assembly Products
Autom. Temp. Contr. Co.
Bogue Electric Mfg.
Bristol Co.
Burling Instr. Co.
Cole Instr. Co.
Cooper Co., Clark
Cybertronic Corp.
Edison Inc., Thomas A.
Electric Devices Co.
Electron-Radar Prods.
Elematic Equipt. Corp.
Fenwal, Inc.
Fielden Instr. Div.
GE, Instr. Dept.
Hallikainen Insts.
Harco Labs.
Illinois Testing Labs.
Industrial Control Panel
Kybernetes Corp.
Leeds & Northrup
Lewis Engrg. Co.
Mack Electric Devices
Manning, Maxwell & Moore
Mercoid Corp.
Moeller Instr. Co.
Norden-Ketay
Panellit, Inc.
Phila. Scientific Glass
Powers Reg. Co.
Prec. Thermom. & Insts.
Pyrometer Instr. Co.
SCAM Instr. Corp.
Synchro-Start Prods.
Tell-Tronics Prods.
Thermo-Electric Co.
Tigerman Engrg. Co.
United Electric Controls
Victory Engrg. Corp.
Viking Instruments

BEARING TESTERS, including Bearing Testing Machines

Arlin Products
Baker Co.
Baldwin-Lima-Hamilton
Bendix, Eclipse-Pioneer
Beta Corp.
Electro-Mec Lab.
Elgin Natl. Watch
Engineering Res. & Devel.
Engis Equipt. Co.
Erdco Engrg.
Erwood, Inc.
Fafnir Bearing Co.
GE
Hirschmann Co.
Illinois Testing Labs.
Koehler Instr. Co.
Krouse Testing Mach.
Lennard Co., Inc.
Lessells & Assocs.
Librascope, Burbank Div.
Micrometrical Mfg. Co.
Olsen Testing Machine
Orban Co., Kurt
Panoramic Radio Prods.
Physics Research
Sheffield Corp.
Vectron, Inc.

BEARINGS, Agate

Amer. Laubscher
Duotone Co.
Engis Equipt. Co.
Gallien, R. P.
Geophysical Instr. Div.
Grobet File Corp.
Hamilton Watch
Imetra Co. Ltd.
Industrial Jewel Bearing
King Gem Co.
Moser Jewel Co.
PIC Design Corp.
Powers, George
Regal Instr. Co.
Swiss Amer. Jewel-Bear.
Swiss Jewel Co.
Vallorbs Jewel Co.
Worley Jewel Co.

BEARINGS, Ball, including Miniature, Roller

Boston Gear Works
Elgin Natl. Watch
Engis Equipt. Co.
Fafnir Bearing Co.
Federal Bearings
Ferner Co.
GE
Hartford Steel Ball
Indust. Techtonics
Keller & Co., L. H.
Landis & Gyr, Inc.
Marlin-Rockwell
McGill Mfg.
Microtech Corp.
Miniature Prec. Bear.
New Departure Div.
N. H. Ball Bearings
Norma-Hoffman
Thomson Industries
U. S. Gasket Co.
Vallorbs Jewel Co.

BEARINGS, Jewel, see Jewels

BEARINGS, Precious Metal

Amer. Platinum Wks.
Amer. Silver Co.
Baker & Co.
Bayside Watch Tool
Bird & Co.
Bishop & Co., J.
Duotone Co.
Halax Corp.
Hamilton Watch
Industrial Jewel Bearing
Indust. Techtonics
Keystone Carbon Co.
Mallory & Co., P. R.
Metals & Controls
Ney Co.
Permco Products Corp.
Vallorbs Jewel Co.
Wilson Co.

BEARINGS, Ring

Bayside Watch Tool
Bird & Co.
Eaton Mfg. Reliance Div.
Elgin National Watch
GE
Halax Corp.
Keller & Co.
Mallory & Co., P. R.
Newall Mfg.
Swiss Amer. Jewel-Bear.
Swiss Jewel Co.
Vallorbs Jewel Co.

BEARINGS, Self Lubricating

Acushnett Process Co.
Bakelite Div.
Boston Gear Works, Inc.
Chemalloy Electronics Corp.
Continental-Diamond Fibre
Crane Packing Co.
Crowley & Co.
Graphite Metallizing
Industrial Tectonics
International Powder
Keystone Carbon Co.
Mallory & Co., P. R.
Moraine Prods. Div.
Morganite, Inc.
N. H. Ball Bearings
National Carbon Co.
Norma-Hoffman Bearings
Ohio Carbon Co.
Polymer Corp.
Raybestos-Manhattan
Richardson Co.
Spaulding Fibre Co.
Thomson Industries
U. S. Gasket Co.

BELLOWS, Kovar

Breeze Corporations
Bristol Co.
Fulton-Sylphon Div.
Giannini & Co.
Stupakoff Div.

BELLOWS, Metallic, including Stainless Steel

Aeromarine Instr. Co.
Alloy Bellows Engrg.
Askania Reg. Co.
Barton Instr. Corp.
Bendix Aviation Corp.
Breeze Corporations
Bridgeport Thermostat
Bristol Co.
Clifford Mfg. Co.
Colvin Labs.
Cook Electric
Fielden Instr. Div.
Flexonics Corp.
Fulton-Sylphon Div.
Giannini Co.
Hammel-Dahl
Jadow, Inc., B.
Kendall Controls
Manning, Maxwell & Moore
Patterson Co., Wayne D.
PIC Design Corp.
Power Engrg. & Equipt.
Res. Appliance Co.
Summers Gyroscope
Titflex, Inc.
U. S. Gauge Div.
Robertshaw-Fulton

BELLOWS, Plastic

Chicago Rawhide Mfg.
Crane Packing Co.
Garlock Packing Co.
Res. Appliance Co.
U. S. Gasket Co.

BELLOWS, Thermostatic

Bridgeport Thermostat
Bristol Co.
Chicago Metal Hose Corp.
Clifford Mfg.
Cook Electric
Flexonics Corp.
Fulton-Sylphon Div.
General Plate Div.
Giannini & Co.
Mercoid Corp.
Robertshaw-Fulton
Seamlex Company, Inc.
United Electric Controls

BENCHES, Optical, see Optical Benches

BENDING MACHINES, see Machines, Metal Forming

BEVEL PROTRACTORS, see Drawing Instruments

BEZELS

Ahrendt Instr. Co.
American Emblem Co.
Bayside Watch Tool
Croname, Inc.
Drake Mfg.
DuMont Labs., Allen B.
Electronic Tube Corp.
Erie Resistor
Etched Products Corp.
Grammes & Sons
Grigoleit Co.
Jan Hardware Mfg.
Maryland Etching Co.
Meyer-Opticraft
Millen Mfg. Co.
Modern Technical Supp.
Molded Insulation Co.
New Haven Clock
Pioneer Instr. Div.
Santay Corp.
Scovill Mfg. Co.
Swift & Anderson
Wadsworth Watch Case
Waterbury Companies
Weber Bros.

BIMETALLIC ELEMENTS, see Thermostatic

BIN LEVEL INDICATORS, see Level Indicators, Bin and Bulk Material

BINAURAL TIMERS, see Timers, Binaural

BINNACLES, see Navigational Instruments

BINOCULARS

Amna Instr. Co.
Bausch & Lomb
Bendix, Eclipse-Pioneer
Bray Optical Co.
Bushnell Optical
Clark & Sons
Edmund Scientific
Ercona Corp.
Fecker, Inc.
Griswold Mfg. Co.
Gordon Enterprises
Hello Instr. Co.
Indust. Scientific, Inc.
Kollsman Instr. Corp.
Leitz, Inc.
Meyer-Opticraft
Negus, T.S. & J.D.
Scope Instr. Corp.
Swift & Anderson
Testa Mfg. Co.
Testrite Instr. Co.
Unertl Optical
Warren Knight
White Co.
Wollensak Optical
Zeiss, Inc., Carl

BINOCULARS, including Polarizing, Variable Density, etc.

Bausch & Lomb
Bushnell Optical
Edmund Scientific
Gordon Enterprises
Jarrell-Ash
Kollsman Instr. Corp.
Polarizing Instr. Co.
QOS Corp.
Testa Mfg. Co.
Unertl Optical

BINS, Small Parts

Federal Screw Prods.
Gold Seal Mfg.
Hall Co.
Littleford Bros.
Valley-National

BLACK LIGHT, see Infrared Sources

BLAST METER, see Flowmeters, Gas, also Pressure Indicators, Peak

BLOCKS, Fuse, see Fuse Blocks

BLOCKS, Gage, see Dimensional Gages, Mechanical

BLOCKS, Terminal, see Terminal Blocks

BOARDS, Bread, see Breadboards

BOILER ROOM INSTRUMENTS, including Condenser Leakage, Damper, Desuperheat, Draft, Feedwater, Specialties, Steam, Stoker etc. (see also Combustion Safeguards, also Gas Analyzers)

Acro Mfg.
Air Assocs.
Askania Reg. Co.
Atlas Valve Co.
Atwood & Morrill
Automatic Temp. Contr. Co.
B-I-F Industries
Beck Co.
Bailey Meter Co.
Barber Colman
Bar-Ray Products
Black Sivalls & Bryson
Boylston Co.
Bray Optical
Bristol Co.
Brooke Engrg. Co.
Brooks Rotameter
Builders-Providence, Inc.
B. W. Controller Corp.
Cal-Tronics Corp.
Campbell Co., J. A.
Cash Co., A. W.
Cash Valve Mfg. Corp.
Century Instr. Co.
Cleveland Fuel Equipt.
Climax Div.
Combustion Control Corp.
Conoflow Corp.
Continental Foundry
Cook Electric
Cutler-Hammer
Dahl & Co., G. W.
Davis Reg. Co.
Denver Fire Clay Co.
De-Tec-Tronic Corp.
Dietz Co., Henry G.
Diamond Power Spec. Corp.
Doelcam Div.
Douglass Automatic
Dressen-Barnes
Dwyer Mfg.
Eclipse Fuel Engrg.
Electronics Prods. Co.
Emmett Machine
Ess Instr. Co.
Fielden Instr. Div.
Fischer & Porter Co.
Fisher Governor
Foster Engrg. Co.
Foxboro Co.
Fuel Watchman
Fulton-Sylphon Div.
General Controls
General Power Plant
General Reg. Corp.
Gleason-Avery
Hagan Corp.
Hammel-Dahl
Hays Corp.
Henszey Co.
Industrial Instruments, Inc.
Industrol Corp.
Jerguson Gage
Jo-Bell Products
Johnson Corp.
Johnson Service Co.
Jordan Regulator Corp.
Kates Co., W. A.
Kaye & MacDonald
Kellogg Switchboard
Kieley & Mueller
Klipfel Valves
Lapp Insulator
Larson Instr. Co.
Leeds & Northrup
Leslie Co.
Lumenite Electronic
Magnetrol, Inc.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Mason-Neilan Div.
McAlear Mfg.
McDonnell & Miller
Mercoid Corp.
Mercon Reg. Co.
Merritt Engrg. & Sales
Minneapolis-Honeywell
Moore Products
National Co., Inc.
Natural Gas Equipt. Co.
Northern Equipt. Co.
Penberthy Injector Co.
Penn Insts. Div.
Penn Ind. Inst. Div.
Powers Reg. Co.
Preferred Utilities Mfg.
Reliance Gauge Column
Reliance Instr. Mfg.
Republic Flow Meters
Research Controls
Revere Corp.
Reynolds Gas. Reg.
Rory Co., Milton
Schade Valve Mfg.
Scientific Instr. Co.
Scrayco Mfg. Co.
Security Valve Corp.
Seely Inst. Co., Inc.
Shallcross Mfg.
Shallcross Controls
Simplex Valve & Meter
Soreng Products
Spence Engrg. Co.
Squires Co., C. E.
Summers Gyroscope
Swartwout Co.
Taylor Instr. Cos.
Trerice Co.
Trimount Instr. Co.
U. S. Gauge Div.
Valv-Trol Co.
Wallace & Tiernan
Warrick Co.
Watts Reg. Co.
Weston Electcl. Instr.
Wheelco Instr. Div.
White Rodgers Electric
Yarnall-Waring

BOLOMETER TUBES, see Radiation Pickups

BOLOMETERS, see Radiation Pickups

BOLTS, Special, Heat Treated

Albany Prods. Co.
Allmetal Screw Products
Amer. Laubscher
Amer. Screw Co.
Anti-Corrosive Metal Prods.
Autoscrew Co.
Chicago Screw Co.
Conant Bros.
Continental Screw Co.
Federal Screw Prods.
Hartford Machine Screw
Karl, Inc.
Hubbell Metals
Natl. Automatic Prods.
Scovill Mfg.
Stafford Co.
Stronghold Screw Prods.
Torrington Co.
United Screw & Bolt
Wheaton Co.

BOLTS, Special, Stainless Steel

Albany Prods. Co.
Amer. Laubscher
Amer. Screw Co.
Anti-Corrsive Metal Prods.
Automatic Methods, Inc.
Autoscrew Co.
Chicago Screw Co.
Conant Bros.
Continental Screw Co.
Federal Screw Prods.
Hartford Mach. Screw
Heltz, Karl, Inc.
Hubbell Metals
Metal Goods Corp.
Natl. Automatic Prods.
Schnitzer Alloy Prods.
Stronghold Screw Prods.
Swissomatic Products
Torrington Co.
United Screw & Bolt
Waltham Screw Co.
Woodruff & Stokes

BOMBS, High Pressure for Testing Bottom Hole Samples, Oil and Gas

Amer. Instr. Co.
Autoclave Engrs.
Coleman Instr. Co.
High Pressure Equipt.
Hoke, Inc.
Koehler Instr. Co.
Labline, Inc.
Precision Scientific
Pressure Prods. Industries
Refinery Supply Co.
Ruska Instr. Corp.
Vapor Recovery Systems

BOMBS, Hydrogenation, Lean Oil

Amer. Instr. Co.
Autoclave Engineers
Daniel Orifice Fitting
High Pressure Equipt. Co.
Parr Instr. Co.
Precision Scientific
Pressure Prods. Industries
Ruska Instr. Corp.

BOMBS, Micro Combustion

Autoclave Engineers
Fish-Schurman
High Pressure Equipt. Co.
Indust. Scientific
Microchemical Service
Parr Instr. Co.
Precision Scientific
Pressure Prods. Industries

BOMBS, Oxygen, Sodium Peroxide, Sulphur, etc.

Autoclave Engrs.
Central Scientific
Emerson App. Co.
High Pressure Equipt.
Hill & Co.
Indust. Scientific, Inc.
Koehler Instr. Co.
Labline, Inc.
Parr Instr. Co.
Precision Scientific
Pressure Prods. Industries
Refinery Supply
Scott Co., Hermon Hosmer
Scott Testers, Inc.
Wall Colmonoy

BOMBS, Reid Vapor Pressure

Amer. Instr. Co.
Central Scientific
Daniel Orifice Fitting
Hallikainen Instruments
Indust. Scientific
Koehler Instr. Co.
Labline, Inc.
Precision Scientific
Refinery Supply Co.
Technical Equipt. Co.
Weston Electcl. Instr.

BOMBS, Specific Gravity, see Specific Gravity Bombs

BOMBS, Temperature, see Temperature Bombs

BORE INSPECTION INSTRUMENTS, see Telescopes, Bore, Inspection

BOTTLES, Cubic Foot, see Specific Gravity Bottles

BOTTLES, Specific Gravity, see Specific Gravity Bottles

BOTTLES, Weighting, see Weighing Bottles

BOURDON TUBES and COILS, see Tubing, Bourdon

BOW CIRCLES, see Drawing Instruments

BOXES, see Cabinets, also Panels

BOXES, Ayrton Shunt, see Shunts, Ayrton

BOXES, Ratio, see Resistance Ratio Boxes

BOXES, Resistance, see Resistance Boxes

BOXES, Thermostat, see Thermostats

BRAKE TESTING INSTRUMENTS

Amer. Instr. Co.
Askania-Werke A. G.
Bendix Aviation Corp.
Clough-Brengle
Commercial Research Div.
Cramer Controls Corp.
Emery Co.
Epic Inc.
Gilmore Industries \
Triumph Mfg.
Wallace & Tiernan

BREADBOARDS

Davenport Mfg.
DuMont Labs., Allen B.
Helirot Div.
Peschel Electronics
PIC Design Corp.
Servomechanisms, Inc.
Sterling Precision Corp.
Tri-Dex Electronics
Victor Electronic

BREAKERS, Circuit, see Circuit Breakers

BRIDGES, Balancing and Calibrating, Manual (see also Potentiometers)

Allegany Instr. Co.
Amer. Helicopter Div.
B & F Instruments
B & H Instr. Co.
Boonton Radio
Century Electronics & Insts.
Consol. Electrodynamics
Edcliff Instruments
Electro Measurements, Inc.
Fairchild Electrotech.
Heiland Div.
Indust. Test Equipt. Co.
Leeds & Northrup
Magnetic Instr. Co.
Marconi Instruments
Rubicon Co.
Shallcross Mfg.

BRIDGES, Electrical, AC

Acton Labs.
Aerovox Corp.
Assoc. Research Inc.
Atlantic Research Corp.
Aviation Engrg. Co.
Baldwin-Lima-Hamilton
Boonton Radio
Bristol Co.
Brown Electro-Measurement
Brush Electronics
Cal-Tronics Corp.
Cambridge Instr. Co.
Central Scientific
Clough-Brengle
Consol. Electrodynamics
Daven Co.
Deltron, Inc.
Devtronics, Inc.
Electro Instr., Inc.
Electro Measurements, Inc.
Electronic Dev. Lab.
Electronic & Engrg. Serv.
Electronic Prods. Co.
El-Tronics Co.
Federal Telephone & Radio
Feiler Engrg. Co.
Fielden Instr. Div.
Freed Transf. Co.
GE, Apparatus Sales
General Radio
Gray Instr. Co.
Indikon Co.
Industrial Insts., Inc.
Indust. Test Equipt. Co.
Kahn & Co.
Land-Air, Inc.
Leeds & Northrup
Magnetic Instr. Co.
Marconi Instruments
Polytechnic Res. & Dev.
Radio City Products
Reiner Electronics
Rubicon Co.
Shallcross Mfg.
Sherron Metallic
Southw. Indust. Electronics
Sweets Co., Martin
Technology Instr. Corp.
Thordarson-Meissner
Tobe Deutschmann
Topp Industries
United Optical
United Transf. Corp.

BRIDGES, Electrical, Capacitance

Acton Labs.
Aerovox Corp.
Assoc. Research Inc.
Aviation Engrg. Co.
Avien Inc.
Boonton Radio
Bristol Co.
Brown Electro-Measurement
Brush Electronics
C.G.S. Labs.
Cal-Tronics Corp.
Cambridge Instr. Co.
Central Scientific
Chicago Indust. Instr. Co.
Clippard Instr. Lab.
Clough-Brengle
Commun. Measmts. Lab.
Cornell-Dubilier
Deltron, Inc.
Electro Measurements, Inc.
Electronic Devel. Lab.
Electronic & Engrg. Services
Electronic Instr. Co.
Epic Inc.
Federal Telephone & Radio
Feiler Engrg. Co.
Fielden Instr. Div.
Freed Transf. Co.
GE
General Radio
Gray Instr. Co.
Gulton Mfg.
Indikon Co.
Industrial Insts., Inc.
Indust. Test. Equipt. Co.
Jackson Electcl. Insts.
Jarco Services
Kahn & Co.
Kay-Lab
Laboratory Equipt. Co.
Leeds & Northrup
MacLeod & Hanopol
Magnetic Instr. Co.
Marconi Instruments
Measurements Corp.
RCA
Rubicon Co.
Scientific Specialties
Shallcross Mfg. Corp.
Sherron Metallic
Sierra Electronic
Simmonds Accessories
Simpson Electric
Shallcross Mfg.
Solar Mfg.
Southwestern Indust. Elect.
Sprague Electric
Sylvania Elect. Prods.
Sweets Co., Martin
Technology Instr. Corp.
Thordarson-Meissner
Tobe Deutschmann
Topp Industries
Triplett Electc.
Triumph Mfg.
United Optical

BRIDGES, Electrical, Conductivity

Aerovox Corp.
Assoc. Research Inc.
Boonton Radio
Bristol Co.
Cal-Tronics Corp.
Cambridge Instr. Co.
Central Scientific
Clippard Instr. Lab.
Edin Electronics
Electro-Mec Lab.
Electro Measurements, Inc.
Electronic Prods. Co.
Federal Telephone & Radio
Feiler Engrg. Co.
Fielden Instr. Div.
Freed Transf. Co.
GE
General Radio
Gray Instr. Co.
Industrial Insts., Inc.
Kahn & Co.
Klett Mfg.
Leeds & Northrup
Marconi Instruments
Magnetic Instr. Co.
Mira Scientific Instr.
Natl. Instr. Labs.
Rubicon
Sensitive Res. Instr.
Shallcross Mfg.
Sherron Metallic Corp.
Sorvall Inc.
Sweets Co., Martin
Thwing-Albert
Topp Industries
Thordarson-Meissner
United Optical

BRIDGES, Electrical, DC

Assoc. Research Inc.
Baldwin-Lima-Hamilton
Barber-Colman
Barnes Devel. Co.
B & H Instr. Co.
B & F Instr. Co.
Borden Engrg. Div.
Bristol Co.
Brown Electro-Measurement
Cal-Tronics Corp.
Cambridge Instr. Co.
Clippard Instr. Lab.
Daven Co.
Devtronics, Inc.
Donner Scientific
Eastern Precision Resistor
Edin Electronics
Electro Instr., Inc.
Electro-Mec Lab.
Electro Measurements, Inc.
Electronic Devel. Lab.
El-Tronics, Inc.
Eppley Laboratory, Inc.
Federal Telephone & Radio
Feiler Engrg. Co.
Fielden Instr. Div.
Fisher Scientific
Freed Transf. Co.
General Radio
Gray Instr. Co.
Humphrey Inc.
Indust. Test Equipt. Co.
Industrial Electronics
Industrial Insts., Inc.
Kahn & Co.
Leeds & Northrup
Magnetic Instr. Co.
Marconi Instrumets
Measurements Corp.
Physics Research Labs.
Pimex, Inc.
Radio City Products
RCA
Reiner Electronics
Rubicon Co.
Shallcross Mfg. Co.
Sherron Metallic Corp.
Sticht Co.
Sweets Co., Martin
Thordarson-Meissner
Thwing-Albert
Topp Industries
United Optical
Winslow Co.

BRIDGES, Electrical, Hoopes

Austin Co.
Freed Transf. Co.
Gray Instr. Co.
Leeds & Northrup
Magnetic Instr. Co.
Thordarson-Meissner

BRIDGES, Electrical, Impedance

Acton Labs.
Advance Electronics
Allied Prods. Div.
Atlantic Research
Boonton Radio
Bristol Co.
Brown Electro-Measurement
C.G.S. Labs.
Cal-Tronics Corp.
Chesapeake Instr. Corp.
Clarke Instr. Corp.
Clough-Brengle
Conant Labs.
Daven Co.
Deltron, Inc.
Electro Measurements, Inc.
Electronic Devel. Lab.
F. R. Machine Works
Federal Telephone & Radio
Feiler Engrg. Co.
Fielden Instr. Div.
Freed Transf. Co.
GE
General Radio
Gray Instr. Co.
Hewlett-Packard
Industrial Insts., Inc.
Indust. Test Equipt.
Kahn & Co.
Kay-Lab.
Leeds & Northrup
Magnetic Instr. Co.
Marconi Instruments
Meyer-Opticraft
Millivac Instruments
Radex Corp.
RCA
Reiner Electronics
Scientific Specialties
Scott, Inc., Hermon Hosmer
Shallcross Mfg.
Shasta Div.
Sierra Electronic
Southwestern Indust. Elect.
Sweets Co., Martin
Technology Instr. Co.
Thwing-Albert
Topp Industries
United Optical
Waters Mfg.
Winslow Co.

BRIDGES, Electrical, Inductance

Acton Labs.
Allied Prods. Div.
Assoc. Research Inc.
Berkeley Div.
Boonton Radio
Bristol Co.
Brown Electro-Measurement
Brush Electronics
Cal-Tronics Corp.
Cambridge Instr. Co.
C.G.S. Labs.
Clough-Brengle
Daven Co.
Electro Measurements, Inc.
Electronic Devel. Lab.
Electronic Instr. Co.
Federal Telephone & Radio
Feiler Engrg. Co.
Fielden Instr. Div.
Freed Transf. Co.
GE
General Radio
Gray Instr. Co.
Industrial Instr., Inc.
Indust. Test Equipt. Co.
Kahn & Co.
Kay-Lab
Leeds & Northrup
Magnetic Instr. Co.
Marconi Instruments
Measurements Corp.
Pacific Instr. Co.
Raytheon Mfg.
RCA
Rubicon Co.
Shallcross Mfg.
Sierra Electronic Corp.
Southw. Ind. Electronics
Sweet Co., Martin
Technology Instr., Corp.
Thordarson-Meissner
Topp Industries
Triumph Mfg.
United Optical
Waters Co.
Winslow Co.

BRIDGES, Electrical, Kelvin

Assoc. Research Inc.
Baldwin-Lima-Hamilton
Beck Bros.
Bristol Co.
Cambridge Instr. Co.
Central Scientific
Eastern Precision Resistor
Electro Prods. Lab.
Eppley Laboratory
Feiler Engrg. Co.
Freed Transf. Co.
GE, Apparatus Sales
Gray Instr. Co.
Industrial Insts., Inc.
Kahn & Co.
Leeds & Northrup
Physics Research Labs.
Pimex, Inc.
Rubicon Co.
Shallcross Mfg.
Sticht Co.
Thwing-Albert
Weston Electcl. Instr.
Winslow Co.

BRIDGES, Electrical, Limit

ACF Electronics
Assoc. Research Inc.
Authorized Mfrs. Serv.
Automatic Electric
Barber-Colman
Barnes Chicago
Cal-Tronics Corp.
Chicago Indust. Instr. Co.
Clippard Instr. Lab.
Commun. Measmts. Lab.
Davenport Mfg. Co.
Donner Scientific
Eastern Precision Resistor
Electro-Mec. Lab.
Electro Measurements, Inc.
Electronic Devel. Lab.
El-Tronics, Inc.
Federal Telephone & Radio
Feiler Engrg. Co.
Fielden Instr. Div.
Freed Transf. Co.
General Radio
Gray Instr. Co.
Indikon Co.
Industrial Insts., Inc.
Indust. Test Equipt. Co.
Leeds & Northrup
Magnetic Instr. Co.
Radio City Products
Reiner Electronics
Rubicon Co.
Scott, Inc. Hermon Homer
Shallcross Mfg.
Sticht Co.
Sweets Co., Martin
Winslow Co

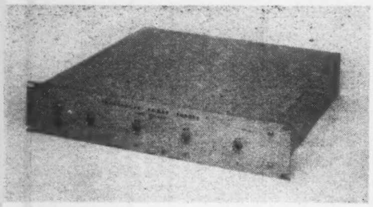
B & F provides the all important LINK between the STRAIN GAGE or RESISTANCE PICKUP and the RECORDING OSCILLOGRAPH.
Bridge-Balance & Calibrating Units

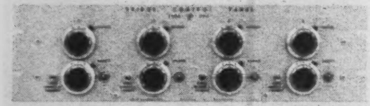
6, 12, 18, & 24 Channel Models with THOUSANDS of operational hours meet all Flight & Lab. requirements.

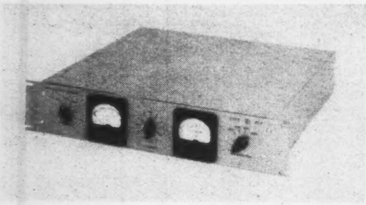
Chassis or Panel Mounts
AUTOMATIC CALIBRATION SERIES OR SHUNT

B&F instruments, Inc.
4732 N. Broad St., Philadelphia 41, Pa.

For more information circle 76 on inquiry card.







STRAIN GAGE AND TRANSDUCER
Power Supplies, Controls, and Auxiliary Panels

Single and multi-channel d-c power supplies for all grounded and floating applications.

Bridge control, balance, and calibration equipment, both standard and special designs.

Voltage-check, balance galvanometer, and attenuator panels for large or small systems.

Owen LABORATORIES

55 Beacon Place
Pasadena, California, USA
Representatives in Principal Cities

For more information circle **77** on inquiry card.

BRIDGES, Electrical, Power-Factor

Acton Labs.
Allied Prods. Div.
Boonton Radio
Cal-Tronics Corp.
Cambridge Inst. Co.
Clough-Brengle
Electronic Devel. Lab.
Electronic Instr. Co.
Federal Telephone & Radio
GE
General Electronic
General Radio
Gray Instr. Co.
Industrial Instruments
Indust. Test Equipt. Co.
Leeds & Northrup
Magnetic Instr. Co.
Marconi Instruments
Physics Research Labs.

BRIDGES, Electrical, Self-balancing, see Potentiometers

BRIDGES, Electrical, Strain Gage

Aero Electronics
Allegany Instr. Co.
Allied Prods. Div.
Amer. Helicopter Div.
B & F Instruments
Baldwin-Lima-Hamilton
Bristol Co.
Brush Electronics
Century Electronics & Insts.
Consol. Electrodynamics
DuMont Labs. Allen B.
Dynamic Instr. Co.
Ellis Assocs.
Fielden Instr. Div.
Franklin Electronics
Furst Electronics
Gilmore Industries
Gray Instr. Co.
Hathaway Instr. Co.
Heiland Div.
Indikon Co.
Industrial Electronics
Lessells & Assocs.
Magnetic Instr. Co.
Miller Instruments
RCA Div.
Rubicon Co.
Taller & Cooper
Thwing-Albert

BRIDGES, Electrical, Vacuum Tube

Bendix, Eclipse-Pioneer
Boonton Radio
Bristol Co.
Central Scientific
Crown Ind. Prods.
Donner Scientific
Electro Prods. Lab.
Electronic Prods. Co.
Electronic & Engrg. Co.
El-Tronics, Inc.
Feiler Engrg. Co.
Fisher Scientific
GE
General Radio
Harvey Radio Labs.
Industrial Insts. Inc.
Lear, Inc.
Magnetic Instr. Co.
Marconi Instruments
RCA Div.
Southw. Ind. Electronics
Shallcross Mfg.
Sylvania Elect. Prods.
Televiso Co.
Thordarson-Meissner
Thwing-Albert
Triumph Mfg. Co.
Waters Mfg.
Wilson & Co.

BRIDGES, Electrical, Wattmeter

Aerovox Corp.
Brunswick Instruments
Computer Co. of Amer.
Electron-Radar Prods.
Freed Transf. Co.
Hamilton Watch
Hycon Mfg. Co.
Industrial Test Equipt.
Magnetic Instr. Co.
Rollin Co.
Simpson Electric
Sperry Gyroscope
United Optical

BRIDGES, Electrical, Wheatstone

Allied Prods. Div.
Assoc. Research Inc.
B & H Instr. Co.
Baldwin-Lima-Hamilton
Barnes Devel. Co.
Beck Bros.
Biddle Co., James G.
Borden Engrg. Div.
Bristol Co.
Brown Electro-Measurement
Brush Electronics
Cal-Tronics Corp.
Cambridge Instr. Co.
Central Scientific
Chicago App. Co.
Commun. Measmts. Lab.
Consol. Res. Co.
Daven Co.
Deltron, Inc.
Eastern Precision Resistor
Electro Measurements, Inc.
Electro-Mec Lab.
Electro Prods. Lab.
Electro-Tech Equipt.
Electronic Devel. Lab.
Electronic Instr. Co.
Englehard, Inc., Chas.
Epic. Inc.
Eppley Laboratory
Federal Telephone & Radio
Feedback Controls
Feiler Engrg. Co.
Fielden Instr. Div.
Fisher Scientific
General Radio
Gray Instr. Co.
Hamilton Watch
Industrial Control Co.
Industrial Electronics
Industrial Insts., Inc.
Indust. Test Equipt.
Kahn & Co.
Land-Air, Inc.
Leeds & Northrup
Magnetic Instr. Co.
Marconi Instruments
Physics Research Labs.
Pimex, Inc.
RCA
Reiner Electronics
Reliance Instr. Mfg. Corp.
Roller-Smith
Rubicon Co.
Scientific Specialties
Servonics, Inc.
Shallcross Mfg.
Special Instruments Lab.
Std. Science Supply
Sticht Co.
Thwing-Albert
United Optical
Welch Mfg. Co., W. M.
Weston Electcl. Instr.
Winslow Co.

BRINELL MACHINES, see Hardness Testing Machines, Brinell

BRUSHES, Carbon, Graphite, Metal, etc.

Airflyte Electronic Co.
Electro Devel. Co.
Electro-Minatures Corp.
GE
Graphite Metallizing Corp.
Keystone Carbon Co.
Linde Air Products
Mallory & Co., P. R.
Modern Techn. Supp.
National Carbon Co.
Ohio Carbon Co.
Osborn Electric
Sittler Corp.
Slip Ring Co. of Amer.
Speer Carbon Co.
Stackpole Carbon Co.
Westinghouse Electric
Wilson Co.

B. T. U. INDICATORS

Bailey Meter Co.
Bristol Co.
Central Scientific
Cosa Corp.
Cutler-Hammer
Engelhard, Inc. Chas.
Hays Corp.
Hagan Corp.
Penn Insts. Div.
Precision Scientific

BUBBLERS, see Sight Flow Bubblers

BULBS, Rubber

Acushnet Process Co.
Armstrong Cork
Goodrich Co., B. F.
Indust. Scientific
Republic Rubber
U. S. Rubber

BULBS, Thermometer

Barber-Colman
Bristol Co.
Edison Inc. Thomas A.
Eisele & Co.
Fischer & Porter Co.
Fish-Schurman
Foxboro Co.
GE
Leeds & Northrup
Lewis Engrg. Co.
Minneapolis-Honeywell
Moeller Instr. Co.
Palmer Thermometers, Inc.
Porter, Inc.
Ruge Assocs.
Scientific Instr. Co.
Seegers Mfg.
Tell-Tronics Prods.
Trans-Sonics, Inc.
Trerice Co.
Weston Electcl. Instr.
Winslow Co.

BURETTES

Ace Glass
Bacharach Indust. Instr.
Bellco Glass, Inc.
Burrell Corp.
Central Scientific
Corning Glass Works
Doerr Glass Co.
Eitzen Co., Louis C.
Electronic Prods. Co.
Fischer & Porter Co.
Fish-Schurman
Fisher Scientific
Friedrich & Dimmock
Greiner Glassblowing Lab.
Griebel Co., E.
Hays Corp.
Kahl Scientific Instr.
Indust. Scientific, Inc.
Kimble Glass
Kontes Glass
Laboratory Equipt. Corp.
Macalaster Bicknell
Machlett & Son
Manostat Corp.
Martin & Co.
Microchemical Service
Micro-Metric Inst.
Nester Co.
Owens-Illinois
Palo Lab. Supplies
Podbielniak, Inc.
Prec. Glass Prods.
Rascher & Betzold
Robertson & Co.
Sargent & Co.
Scientific Glass App. Co.
Scientific Instr. Co.
Specialty Glass Co.
Superior Air Prods.
Wakefield Industries

BURSTING TESTING MACHINES, including Mullen Testers

Amthor Testing
Autoclave Engineers
Baldwin-Lima-Hamilton
Cady & Co.
Control Engrg. Co.
Crosby Steam Gage
Dorr-Patterson Engrg.
Hacker & Co.
Insco Company
Mansfield & Green
Marconi Instruments
Olsen Testing Mach.
Perkins & Son
Riehle Div.
Scott Testers
Steel City Testing Machs.
Testing Machines, Inc.
Thwing-Albert
U. S. Testing Co.
Whittington Pump

BUSHINGS, Fused Silica, see Silica, Fused

BUSHINGS, Hermetically Sealed

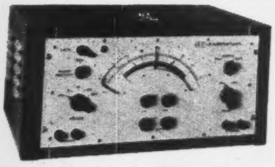
Amer. Lava Corp.
Centralab Div.
Corning Glass Works
Electrical Industries, Inc.
Farnsworth Electronics
Fish-Schurman
Fusite Corp.
Garde Mfg. Co.
Genl. Ceramics & Steatite
Ohio Carbon Co.
Sealtron Co.
Steatite Div.
Stupakoff Div.
Triad Transformer Corp.
U. S. Gasket Co.

BUSHINGS, Metallic

Acme Scientific
Amer. Laubscher
Autoscrew Co.
Bayside Watch Tool
Bead Chain Mfg.
Belmont Smelt. & Ref.
Beryllium Corp.
Buchanan Electcl. Prods.
Crafts & Co.
Division Lead Co.
Federal Screw Prods.
GE, Metallurgical
Graphite Metallizing Corp.
Harris & Co.
Haynes Stellite
Heitz, Karl, Inc.
Heli-Coil Corp.
Hirschmann Co.
Instrument Parts Corp.
Insuline Corp. of Amer.
Internat. Powder Metallurg
Jan Hardware Mfg.
Jessup Engrg. & Dev. Co.
Keystone Carbon Co.
Mallory & Co., P. R.
Moraine Prods. Div.
Natl. Automatic Prods.
Patterson Co., Wayne D.
PIC Design Corp.
Preco Co.
Pyle-National
Res. Devel. Manufacture
Smith, Inc., Herman H.
Std. Automation Prods.
Steel Co., Herman D.
Wilder, Inc.
Willey's Carbide Tool

BUSHINGS, Non-metallic, including Ceramic

Acme Scientific
Amer. Felt Co.
Amer. Lava Corp.
Armstrong Cork
Autoscrew Co.
Birnbach Radio
Cambridge Thermionic
Centralab Div.
Ceramaseal Co.
Consol. Molded Prods.
Corning Glass Works
Crane Packing Co.
Creative Plastics Corp.



BARNES DEVIATION BRIDGE
MANUAL OR AUTOMATIC HIGH SPEED RESISTANCE COMPARATOR

- High stability based on NULL-BALANCE principle
- Freedom from zero drift
- High production accuracy for resistors to ± 0.1%

Range: 10 ohms to 20 megohms
Scale: Standard ± 2% and ± 20%
Special ± .25% to ± 40%
Accuracy: .5% of full scale
Primary Power: 115 V., 60 cycle AC, 100 Watts
Speed: Up to 3000 measurements per hour
Output Relay Capacity: 5 amperes at 115 Volts

High rate automatic sorting and handling mechanisms are available for use with this instrument.

May also be used for continuous process monitoring where a resistance reading is a measure of the process.

BD
BARNES DEVELOPMENT COMPANY
213 W. Baltimore Pike, Lansdowne, Pennsylvania

For more information circle **78** on inquiry card.

Du-Co Ceramics
Electronics Mechanics
Fish-Schurman
Formica Co.
Genl. Ceramics & Steatite
GE
Goodrich Co., B. F.
Graphite Metallizing Corp.
Hermetic Sealed
Instrument Parts Corp.
Insulation Mfrs. Corp.
Insuline Corp. of Amer.
Jessup Engrg. & Devel. Co.
Keystone Carbon Co.
Kirchberger & Co.
Lapp Insulator
Lord Mfg. Co.
Luzerne Rubber
McDaniel Refractory
Mica Insulator
Mycalex Corp.
Polymer Corp.
Prec. Glass Prods.
Richardson Co.
Saxonburg Ceramics
Sealtron Co.
Shallcross Mfg.
Spaulding Fibre Co.
Steatite Div.
Steward Mfg. Co., W. D.
Stupakoff Div.
Superior Steatite
Thomson Industries
U. S. Gasket Co.
Victor Electronic
Wilmington Fibre

BUSHING, Sapphire Filament Coiling

Bakelite Div.
Bird & Co.
Elgin Natl. Watch
Gallien, R. P.
Gatti, Aurele M.
metra Co. Ltd.
Industrial Jewel Bearing
Jones Optical
Karp Metal Prods.
Powers, George
Steel Co., Herman H.
Swiss Amer. Jewel Bear.
Swiss Jewel Co.
Vorley Jewel Co.

CABIN PRESSURE CONTROLS, Aircraft, see Aircraft Instruments

CABINETS, Instruments (see also Cases)

Alden Products
Allied Engraving
Amer. Instr. Co.
Amer. Kloeckner-Moeller
Barber Colman
Bowser, Inc.
Bristol Co.
Bud Radio
Cal-Tronics Corp.
Columbus Metal
Craig Systems
Croname, Inc.
Daven Co.
Daystrom Instr. Div.
Dittmore & Freimuth
Edin Co.
Engrg. & Res. Corp.
Falstrom Co.
Fisher & Porter Co.
Fisher Scientific
Gallien, R. P.
Gold Seal Mfg.
Grain Lab. Equipt.
Grammes & Sons
Gurley, W. L. & E.
Hall Co.
Hathaway Instr. Co.
Insuline Corp. of Amer.
Johnson Co., E. F.
Karp Metal Prods.
Keller Products
Kirk & Blum
Lewyt Corp.
Littleford Bros.
Machined Prods Co.
Magnavox Co.
Molded Insulation
Moss & Co., Henry
Nankervis Co.
Newall Mfg.
New England Box Co.
New Haven Clock
Par Metal Prods.
Photo Chemical Prods.
Pneumafil Corp.
Premier Metal Prods.
Reiner Electronics
Richardson Co.
Riester & Thesmacher
Rueckert Mfg.
Statolet Corp.
Suffolk Products
Swanson Engrg. Co.
Thermco Laboratories
United Mfg Co.
Vendrak Corp.
Warwick Prods. Co.
Weber Bros.
Wolff Woodcraft
Zero Mfg. Co.

CABINETS, Test, see Environmental Test Chambers

CABLE (see also Wire)

Anaconda Wire & Cable
Automatic Electric
Belden Mfg.
Birnback Radio
Brand Co.,
Chester Cable
Cornish Wire Co.
Eastern Specialty Co.
Engrg. & Res. Corp.
Essex Wire Corp.
Federal Telephone & Radio
GE
Koiled Kords, Inc.
Lens Elect. & Mfg. Co.
Microdot, Inc.
Modern Technical
Okonite Co.
Phalo Plastics Corp.
Reiner Electronics Co.
Revere Corp. of Amer.
Rex Corp.
Roebling's Sons
Sequoia Process Co.
Sittler Corp.
Surprenant Electric
Tensolite Insul. Wire Co.
U. S. Rubber Co.
Whitney Blake Co.

CABLE ASSEMBLIES

Aircraft-Marine Prods.
Airflyte Electronics
Alden Products
Amelco, Inc.
Amphenol Electronics
Arens Controls
Barbour Stockwell
Brand & Co.
Breeze Corporations
Bristol Engrg. Corp.
Bunnell & Co.
Cannon Electric
Carol Electronics
Carter Parts Co.
Coaxial Connector Co.
Cornish Wire Co.
Dage Electric
Dale Products
Danbury-Knudsen
Daystrom Instr. Div.
Diamond Mfg.
Dittmore & Freimuth
DuMont Labs., Allen B.
Eastern Specialty Co.
Edin Co.
Electl. & Phys. Instr.
Empire State Labs.
Engrg. & Research Corp.
Essex Wire Corp.
Felt Corp.
Fischer Spring Co.
GE
Gordos Corp.
Industrial Instrs., Inc,
Instr. Devel. & Mfg. Corp.
Insuline Corp. of Amer.
Koiled Kords, Inc.
Lab-Tronics
Link Aviation
Magnavox Co.
Meyer-Opticraft
Molded Insulation Co.
Mossman, Inc.
Mt. Sopris Instr. Corp.
Natl. Aircraft Corp.
Natl. Tel-Tronics
Nems-Clarke
Nestor Engrg. Co.
Peschel Electronics,
Phalo Plastics Corp.
Phaostron Co.
Radio City Products
Ram Meter, Inc.
Revere Corp. of Amer.
Roebling's Sons
Sequoia Process Co.
Sitter Corp.
Stewart Corp., F. W.
Suffolk Prods. Co.
Surprenant Mfg.
Switchcraft, Inc.
Teleflex, Inc.
Tensolite Insul. Wire Co.
Tri-Dex Electronics
Virginia Electronics
Walkirt Co.
Wheeler Insul. Wire Inc.
Whitney Blake
Winslow Co., Inc.
Zenith Optical

CABLE, Coaxial

American Brass
Amphenol Electronics
Anaconda Wire & Cable
Brand Co.
Chester Cable
Diamond Instr. Co.
Eastern Specialty
Elect. & Phys. Instr.
Engrg. & Res. Corp.
Federal Telephone & Radio
Felt Corp.
Gen. Ceramics & Steatite
GE
General Radio
HiTemp Wires, Inc.
Instruments Inc.
Johnson Co., E. F.
Kistler Instr. Co.
Okonite Co.
Phalo Plastics Corp.
Precision Tube Co.
Preis Engrg. Mach.
Revere Corp.
Rex Corp.
Roeblings Sons
Sequoia Process Co.
Surprenant Mfg.
Tensolite Insul. Wire Co.
Uniform Tubes
Warren Wire Co.
Whitney Blake Co.

CABLE, Flexible, Control

Air Assocs.
Anaconda Wire & Cable
Arens Controls
Barbour Stockwell
Brand & Co.
Chester Cable
Conduflex Corp.
Cornish Wire Co.
Crescent Insul. Wire
Engrg. & Res. Corp.
Farnsworth Electronics
Lewis Engrg. Co.
Lenz Elect. & Mfg.
Microdot, Inc.
Okonite Co.
Rex Corp.
Stewart Mfg.
Teleflex, Inc.
Tensolite Insul. Wire Co.
White Indust. Div., S. S.

CABLE CODING LABELS, see Labels and Tags

CABLE CONNECTORS, see Connectors

CABLE SUPPORTS, see Tubing Supports

CABLE TESTERS

Aircraft Electronics
Amer. Res. Corp.
Amthor Testing
Ann Arbor Instr. Works
Assoc. Research, Inc.
Baldwin-Lima-Hamilton
Berkshire Labs.
Beta Electric
Boonton Radio
Borden Engrg. Div.
Boulin Instr. Corp.
Bristol Engrg. Corp.
Cal-Tronics Corp.
Century Geophysical
Chatillon & Sons
Commun. Measmts. Lab.
Davenport Mfg. Co.
Davis Electric
Dillon & Co.
Dit-Mco, Inc.
El Mec Labs.
Emery Co.
Engrg. & Res. Corp.
Feiler Engrg. Co.
Fruengel Inc.
GE
Gilmore Industries
Gray Instr. Co.
Hacker & Co.
Helipot Div.
Kahn & Co.
Kellogg Switchboard
Krouse Testing Mach.
Leeds & Northrup
Link Aviation
Manson Labs.
Mine Safety Appliances
Multi-Amp Corp.
Nankervis Co.
Olsen Testing Machine
Pacific Scientific
Perkins & Son
Peschel Electronics
Precise Measmts. Co.
Riehle Div.
Scott Testers
Shallcross Mfg.
Sherron Metallic Corp.
Std. Elect. Time Co.
Std. Electronic Res.
Steel City Testing Mach.
Tarc Electronics
Technical Insts. Co.
Testing Machines, Inc.
Thordarson-Meissner
Thwing-Albert
United Mfg.
Virginia Electronics

CALIBRATING EQUIPMENT for Electrical Instruments, see Electrical Instrument Calibrators

CALIBRATING EQUIPMENT for Testing Machines, see Testing Machine Calibrators, also Proving Rings

CALIBRATION CHAMBERS, see Environmental Test Chambers

CALIBRATORS, Flowmeter

Bendix, Pioneer-Central
Computer-Measmts. Corp.
Electro-Pulse, Inc.
Gilmore Industries
Natl. Instr. Labs.
Potter Instr. Co.

CALIBRATORS, Pressure, see Pressure Instrument Calibrators, Deadweight

CALIPER RULES

Amer. Meas. Insts.
Brown & Sharpe
Dixon, Inc.
DoAll Co.
Lufkin Rule Co.
Millers Falls Co.
Scherr Co.
Sheffield Corp.
Starrett Co.
Weber Co.
Zeiss, Inc., Carl

CALIPERS, see Dimensional Gages

CALORIMETERS, Adiabatic, Coal and Fuel

Bowen & Co.
Central Scientific Co.
Dixon, Inc.
Emerson App. Co.
Ever Ready Thermometer
Fisher Scientific
Indust. Scientific
Parr Instr. Co.
Precision Scientific
Rec. Thermom. & Insts.
Welch Mfg. Co., W. M.
Wilkens-Anderson

CALORIMETERS, Gas

Amer. Meter Co.
Central Scientific
Connelly, Inc.
Cosa Corp.
Cutler-Hammer
Every Ready Thermometer
Hays Corp.
Indust. Scientific
Lablin, Inc.
Palmer Thermometer, Inc.
Precision Scientific
Prec. Thermom. & Insts.
Refinery Supply Co.
Welch Mfg. Co., W. M.
Wilkens- Anderson

CALORIMETERS, Miscellaneous, including Peroxide Bomb, Photo-electric, Steam, etc.

Amer. Electronic Labs.
Central Scientific
Chemalloy Electronics
Ellison Draft Gage
Ever Ready Thermometer
Fisher Scientific
Indust. Scientific
Natl. Appliance Co.
Parr Instr. Co.
Polytechnic Res. & Devel.
Res. Appliance Co.
WacLine, Inc.
Wilkens-Anderson

CALORIMETERS, Oxygen Bomb

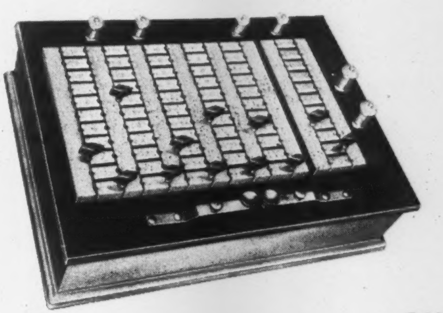
Central Scientific
Emerson App. Co.
Ever Ready Thermometer
Fisher Scientific
Indust. Scientific
Parr Instr. Co.
Refinery Supply Co.

CAMERA SHUTTER TESTERS

Amer. Chronoscope
Berkeley Div.
G. M. Mfg.
Gordon Enterprises
Hupp Instrumentation
Potter Instr. Co.
Hycon Mfg. Co.
I-L-S Instr. Co.
Shepard Labs.
Sunshine Scientific
Taller & Cooper
Triumph Mfg.

CAMERAS, Aerial

Abrams Corp.
Amer. Instr. Co.
Bell & Howell



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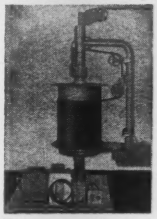

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Bronoptics Co.
Farrand Optical
Fairchild (Syosset)
Fecker, Inc.
Flight Res., Inc.
Gordon Enterprises
Hulcher Co.
Hycon Mfg.
Jack Scient. Instr. Co., Bill
Librascope, Inc.
Mauer, Inc.
Norden-Ketay
Opplem Co., Inc.
Pacific Labs.
Perkin-Elmer
Specialties, Inc.
Sterling Prec. Instr. Corp.
Taller & Cooper
Topp Industries
Unertl Optical
Vectron, Inc.
Vought Co.
Wild Heerbrugg

CAMERAS, Microfilm

Abrams Instr. Corp.
Amer. Optical
Bell & Howell
Bolsey Corp.
Eastman Kodak
Ercona Corp.
Gordon Enterprises
Graflex Corp.
Mauer, Inc.
Microstat Corp.
Pacific Labs.
Photographic Products, Inc.
Praktica Co.
Remington Rand
Vectron, Inc.
Williamson Devel. Co.
Zeiss Inc., Carl

CAMERAS, Oscilloscope Recording

Abrams Instr. Corp.
Allegany Instr. Co.
Amer. Instr. Co.
Aremac Assocs.
Beam Instruments
Berkshire Labs.
Berndt-Bach
Browning Labs.
Cambridge Instr. Co.
Century Geophysical
Coleman Instr. Co.
DuMont Labs., Allen B.
Edgerton, Germeshausen
Electro-Medical Lab.
Electronic Tube Corp.
Fairchild (Syosset)
Flight Res., Inc.
General Radio
Gilman Scientific Instr.
Gordon Enterprises
Grass Instr. Co.
Heiland Div.
Hycon Mfg.
Jack Scient. Instr. Co., Bill
Kearfott (Western)
Mauer, Inc.
Midwestern Instruments
Miller Instruments
Pace Engrg. Co.
Pacific Labs.
Photographic Products, Inc.
Praktica Co.
Rutico, Inc.
Southw. Ind. Electronics
Taller & Cooper
Traid Corp.
Unertl Optical
Warrick Co.
Vought Co.
Wollensak Optical
Zoomar Corp.

CAMERAS, Scientific, including Back Reflection

Abrams Instr. Corp.
Baird Assocs.-Atomic Instr.
Bausch & Lomb
Beckman & Whitley
Bolsey Corp. of Amer.
Brinkmann Instruments
Bronoptics Co.
Brubaker Instr. Co.
Cambridge Instr. Co.
Century Geophysical
Coleman Instr. & Mfg.
Curtiss Labs., Inc.
DuMont Labs., Allen B.
Eastman Kodak
Edgerton, Germeshausen
Electro-Medical Lab.
Ercona Corp.
Farrand Optical
Fecker, Inc.
Flett Lab.
Flight Research Inc.
G M Mfg.
Gadgets, Inc.
GE, X Ray
General Radio
Gilman Scientific Instr.
Gordon Enterprises
Graflex Corp.
Hayes Scientific App.
Heiland Div.
Henson Co.
Hulcher Co.
Hycon Mfg. Co.
Jack Scient. Instr. Co., Bill
Jacobs Instr. Co.
Jarrell-Ash
Laboratory Optical
Lafayette Instr. Co.
Leitz, Inc.
Mauer, Inc.
Mico Instr. Co.
Mitchell Scientific
North Amer. Philips
Opplem Co.
Pancro Mirrors
Perkin-Elmer
Photographic Prods., Inc.
Picker X Ray
Praktica Co.
Process & Instruments
Rutico Inc.
Schneider-Cogswell
Stoelting Co.
Taller & Cooper
Telecomputing Corp.
Topp Industries
Victor Laboratory
Vought Co.
Warrick Co.
Zeiss Inc., Carl
Zoomar Corp.

CAMERAS, Scientific, Diffraction, see X-Ray Cameras, Diffraction

CAMERAS, Scientific, Motion Picture, including High Speed

Aremac Assocs.
Askania-Werke A. G.
Abrams Instrument
Barnes Devel. Co.
Beckman & Whitley
Bell & Howell
Berndt-Bach
Bolsey Corp.
Bronoptics Co.
Brubaker Instr. Co.
Eastern Science Co.
Eastman Kodak
Ercona Corp.
Fairchild Camera & Instr.
Farrand Optical
Flight Res. Inc.
Fruengel Inc.
General Radio
Georator Corp.
Gordon Enterprises
Henson Co.
Jacobs Instruments
Jack Scient. Instr. Co., Bill
Lafayette Instr. Co.
Librascope, Inc.
Mauer, Inc.
Mitchell Camera Corp.
Opplem Co., Inc.
Pancro Mirrors
Perkin-Elmer
Praktica Co.
Process & Instruments
Scherr Co.
Topp Industries
Vectron, Inc.
Vought Co.
Warrick Co.
Wollensak Optical
Zeiss, Inc., Carl
Zoomar Corp.

CAMERAS, Scientific, Photo Micro, see Microscopes, Metallographic

CAMERAS, Television, see Television, Industrial

CAPACITANCE INDICATORS

ACF Electronics
Allied Radio Corp.
Aerovox Corp.
Assoc. Research Inc.
Ballantine Labs.
Barnes Devel. Co.
Biddle Co., Jas. G.
Boonton Radio
Bradshaw Instruments
Brown Electro-Measurement
Brush Electronics
Cambridge Instr. Co.
Clippard Instr. Lab.
Clough-Brengle
Cornell-Dubilier
Daystrom Instr. Div.
Decker Aviation
Deltron, Inc.
Doelcam Div.
Electronic Devel. Lab.
Electronic Instr. Co.
Erdco Engrg. Co.
Federal Telephone & Radio
Feiler Engrg. Co.
Fielden Instr. Div.
Fox Valley Instr.
Foxboro Co.
GE, Apparatus Sales
General Radio
Hickok Electcl. Instr.
Hygrotester Inc.
Indikon Co.
Industrial Control Co.
Industrial Instr. Corp.
Industrial Test Equipt.
Instr. Associates
Instrument Labs.
Jackson Electcl. Instr.
Jarco Services
Kahn & Co.
Kay Electric
Kay-Lab
Kellogg Switchboard
Leeds & Northrup
Liquidometer Corp.
MacLeod & Hanopol
Marconi Instruments
New Haven Clock
Oil Well Water Loc. Co.
Opad Electric
Panoramic Radio
Phaostron Co.
Physics Research Labs.
Potter Co.
Premier Crystal Labs.
Premier Research
Pyramid Electric
Radio City Products
RCA
Reiner Electronics
Robertshaw-Fulton
Rubicon Co.
Sargent & Co.
Schauer Mfg. Co.
Shallcross Mfg.
Sherron Metallic Corp.
Sickles Div.
Sierra Electronic
Simmonds Aerocessories
Solar Mfg.
Sprague Electric
Sun Electric
Sylvania Elect. Prods.
Tobe Deutschmann
Triplett Electcl. Instr.
Westburg Mfg. Co.
Weston Electcl. Instr.
Williams App. Co.
Wilson & Co.
Yellow Springs Instr.

CAPACITANCE STANDARDS, see Standards, Capacitance

CAPACITOR FILMS

Aerovox Corp.
Aircraft-Marine Prods.
Balco Research Labs.
Emerson & Cuming
GE
San Fernando Electric

CAPACITORS, Air

Bud Radio
Cambridge Instr. Co.
Cardwell Mfg.
Chicago Condenser Corp.
Condenser Prods. Co.
Corning Glass Works
Dittmore & Freimuth
GE, Apparatus Sales
General Instr. Co.
General Radio
Hammarlund Mfg.
Insuline Corp. of Amer.
JFD Mfg. Co.
Johanson Mfg. Corp.
Johnson Co., E. F.
Leeds & Northrup
Millen Mfg. Co.
New Haven Clock
North Amer. Philips
Sickles Div.
U. S. Gasket Co.
WacLine, Inc.
Wilmar Mfg.

CAPACITORS, Ceramic

Aerovox Corp.
Allen-Bradley
Amer. Condenser Co.
Amer. Lava Corp.
Arnhold Ceramics
Cambridge Thermionic
Capcon Corp.
Centralab Div.
Cornell Dubilier
Dielectron Div.
Erie Resistor
Fast & Co.
GE
Hi-Q Div.
Insuline Corp. of Amer.
Mallory & Co., P. R.
Mucon Corp.
Speer Carbon
Sprague Electric
Stupakoff Div.

CAPACITORS, Electrolytic

Aerovox Corp.
Amer. Condenser Co.
Astron Corp.
Capcon, Corp.
Chicago Condenser
Cornell-Dubilier
DuMont-Airplane
Fansteel Metallurgical
GE, Apparatus Sales
Industrial Condenser Corp.
Kellogg Switchboard
Magnavox Co.
Mallory & Co., P. R.
Micamold Electronics
National Co., Inc.
New Haven Clock
Ohmite Mfg.
Planet Mfg.
Pyramid Electric
Sangamo Electric
Solar Mfg.
Sprague Electric
Tobe Deutschmann
Walker-Jamieson
Westinghouse Electric

CAPACITORS, Fixed Composition.

Aerovox Corp.
Cornell-Dubilier
Corning Glass Works
DuMont-Airplane
Erie Resistor
GE, Apparatus Sales
Hansen Electronics
Hopkins Engrg. Co.
Industrial Condenser Corp.
Mallory & Co., P. R.
Pyramid Electric
Stackpole Carbon

CAPACITORS, Gas Filled

Epic Inc.
GE
Johnson Co., E. F.
Lapp Insulator

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Arnhold Ceramics
Capcon Corp.
Centralab Div.
Chicago Condenser Corp.
Cornell-Dubilier
Corning Glass Works
Dolinko & Wilkens
Erie Resistor
Fast & Co.
GE, Apparatus Sales
Hi-Q Div.
Hopkins Engrg.
Industrial Condenser Corp.
Jennings Radio Mfg.
Lapp Insulator
Mallory & Co., P. R.
Micamold Electronics
New Haven Clock
Plastic Capacitors, Inc.
Pyramid Electric
Sangamo Electric
Southern Electronics
Speer Carbon Co.
Sprague Electric
Texas Insts., Inc.

CAPACITORS, Metallized Paper

Aerovox Corp.
Airborne Access. Corp.
Amer. Condenser Co.
Arrow Electronics
Astron Corp.
Capcon Corp.
Cornell-Dubilier
Hopkins Engrg. Co.
Industrial Condenser Corp.
Mallory & Co., P. R.
Pyramid Electric
San Fernando Electric
Sprague Electric
Tobe Deutschmann

CAPACITORS, Mica

Aerovox Corp.
American Condenser Co.
Arnhold Ceramics
Cambridge Instr. Co.
Capcon Corp.
Centralab Div.
Continental-Diamond Fibre
Cornell-Dubilier Elect.
Crystal Research Labs.
Electronic Fabricator
Erie Resistor
GE, Apparatus Sales
General Radio
Industrial Insts., Inc.
Kellogg Switchboard
Lectronic Res. Labs.
Leeds & Northrup
Mallory & Co., P. R.
Measurements Corp.
Micamold Electronics
National Co., Inc.
New Haven Clock
RCA
Rubicon Co.
Sangamo Electric
Sickles Co.
Solar Mfg.
Sprague Electric
United Condenser
Winslow Co.

CAPACITORS, Paper

Aerovox Corp.
Amer. Condenser Co.
Arnhold Ceramics
Astron Corp.
Automatic Electric
Capcon Corp.
Chicago Condenser Corp.
Condenser Products
Cornell-Dubilier
DuMont-Airplane
Electrical Utilities
Fast & Co.
Film Capacitors, Inc.
GE, Apparatus Sales
General Radio Co.
Hopkins Engrg. Co.
Industrial Condenser Corp.
Kellogg Switchboard
Lectronic Res. Labs.
Lenkurt Electric
Mallory & Co., P. R.
Micamold Electronics
National Co., Inc.
New Haven Clock
PCA Electronics
Plastic Capacitors, Inc.
Potter Co.
Pyramid Electric
San Fernando Elect. Mfg.
Sangamo Electric
Solar Mfg.
Sprague Electric
Tennant Sons & Co.
Texas Insts., Inc.
Tobe Deutschmann

CAPACITORS, Plastic Dielectric

Aerovox Corp.
Airborne Access. Corp.
Amer. Condenser Corp.
Astron Corp.
Balco Research Labs.
Chicago Condenser Corp.
Condenser Prods. Co.
Continental-Diamond Fibre
Cornell-Dubilier
DuMont-Airplane
Electronic Fabricators
Erie Resistor
Fast & Co.
GE, Apparatus Sales
Hopkins Engrg. Co.
Industrial Condenser Corp.
Lectronic Res. Labs.
Mallory & Co., P. R.
Micamold Electronics
New Haven Clock
Plastic Capacitors, Inc.
Pyramid Electric
Radiation Res. Corp.

Sanders Assocs.
San Fernando Electric
Southern Electronics
Sprague Electric
Texas Insts., Inc.
Tobe Deutschmann
U. S. Gasket Co.

CAPACITORS, Precision (0.01%)

Capcon Corp.
Chicago Condenser Corp.
Cornell-Dubilier
DuMont-Airplane
Federal Telephone & Radio
Hammarlund Mfg.
Industrial Condenser Corp.
JFD Mfg.
Johanson Mfg.
Leeds & Northrup
New Haven Clock
Southern Electronics

CAPACITORS, Tantalum

Aerovox Corp.
Cornell-Dubilier
DuMont-Airplane
Fansteel Metallurgical
GE, Apparatus Sales
Mallory & Co., P. R.
Ohmite Mfg.
Sprague Electric

CAPACITORS, Vacuum

Amperex Electronics
Dolinko & Wilkens
Eitel-McCullough
GE
Grain Lab. Equipt.
Industrial Condenser Corp.
Jennings Radio Mfg.

CAPACITORS, Variable

Aerovox Corp.
Aircraft Radio
Anatran Engrg. Corp.
Arnhold Ceramics
Bud Radio
Cambridge Instr. Co.
Cambridge Thermionic
Cardwell Mfg. Corp.
Centralab Div.
Clarke Instr. Corp.
Clippard Instr. Lab.
Corning Glass Works
Crystal Research Labs.
Dittmore & Freimuth
Eitel-McCullough
Erie Resistor
Federal Telephone & Radio
GE, Apparatus Sales
General Radio
Hammarlund Mfg.
Harvey Radio Labs.
Insuline Corp. of Amer.
JFD Mfg.
Johanson Mfg.
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Warwick Products
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Chicago Mld. Prod.
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Magnecord Inc.
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Rueckert Mfg.
Simpson Electric
Statolet Corp.
Warwick Products

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CELLS, Photoelectric, see Photoelectric Cells

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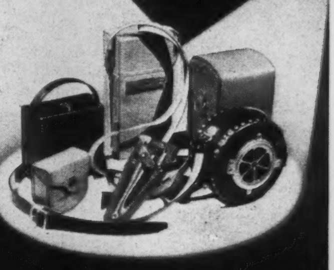

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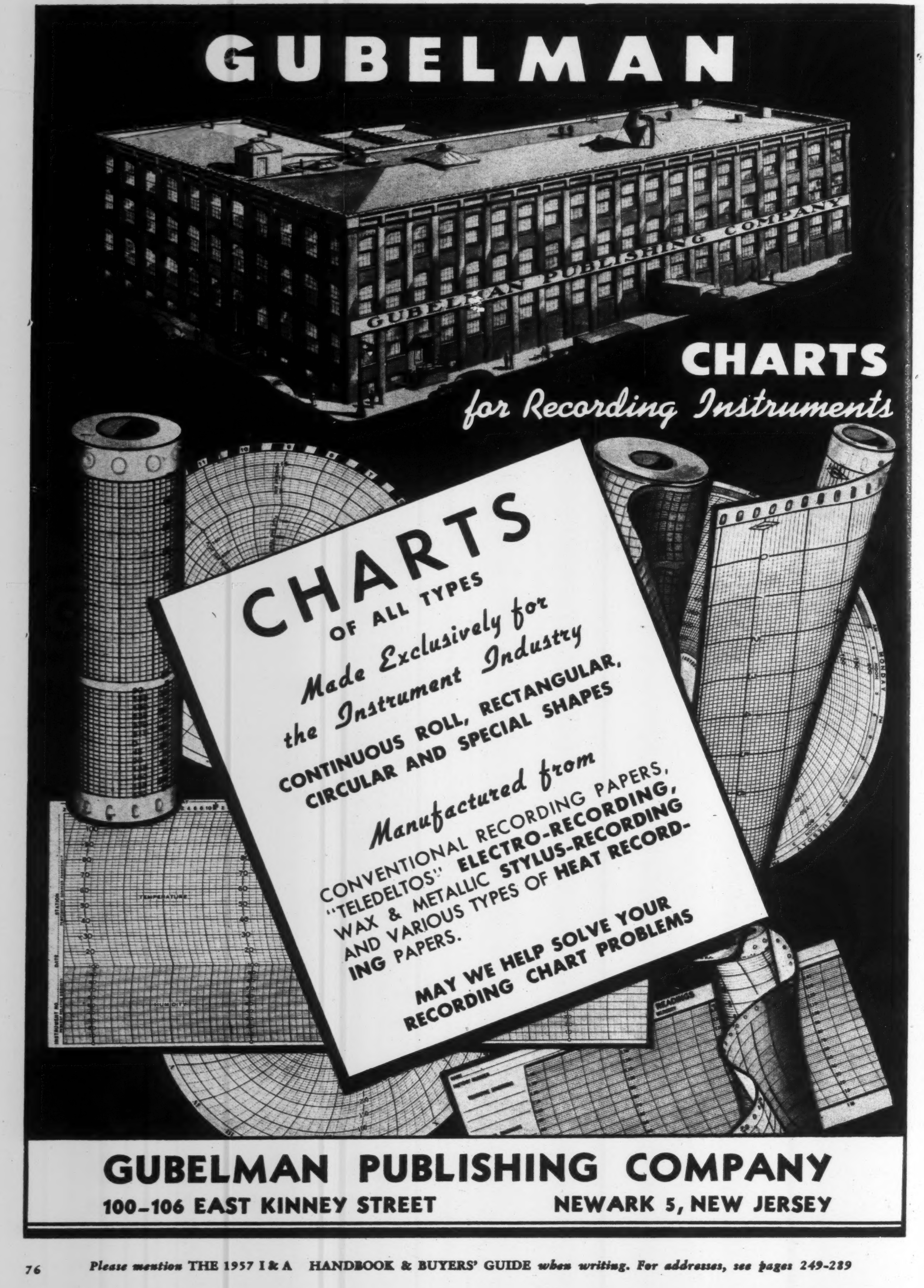

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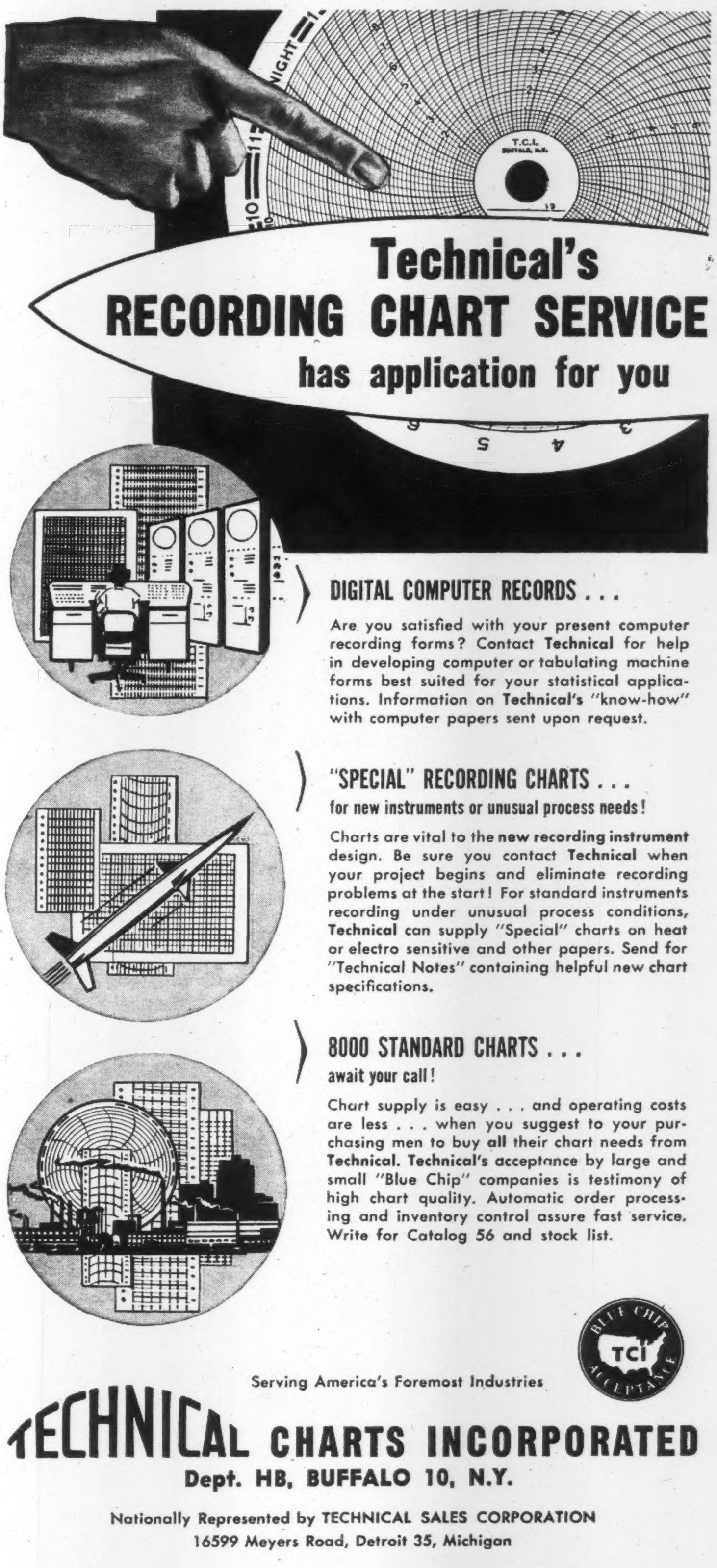

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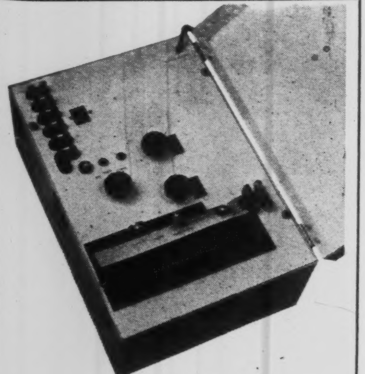

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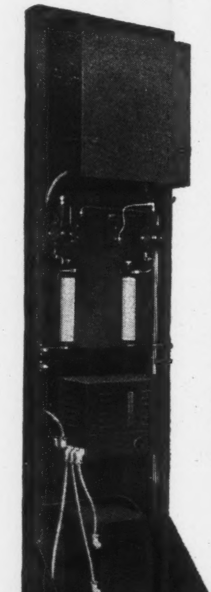

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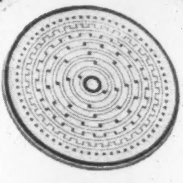
Kay Electric
Kay Electronic
Kearfott (Western)
Kellogg Switchboard
Kepco Labs.
Lear, Inc.
Leeds & Northrup
Littlefuse, Inc.
Lyman Electronic
MacLeod & Hanopol
Magnetic Instr. Co.
Marconi Instruments
Martindale Electric
Measurements Corp.
Meters, Inc.
Millivac Instruments
Norden Instruments
Opad Electric
Pacific Instr. Co.
Penn Optical & Instr.
Peschel Electronics
Phaostron Co.
Precision App. Co.
Radex Corp.
Radiaphone Co.
Radio Frequency Labs.
Radio City Prods. Co.
Raytheon Mfg.
RCA
Reiner Electronics
Roller-Smith
Rubicon Co.
Shallcross Mfg.
Sherron Metallic Corp.
Simpson Electric
Sittler Corp.
Sperry Gyroscope
Stitcht & Co., Herman
Sun Electric
Supreme, Inc.
Sylvania Elect. Prods.
Tarc Electronics
Technical Electronics Corp.
Technology Instr. Corp.
Thordarson-Meissner
Transval Engrg. Corp.
Triplett Elect. Instr.
Triumph Mfg.
United Mfg. Co.
Universal Instr. Co.
Vectron, Inc.
Virginia Electronics
WacLine, Inc.
Waterman Prods. Co.
Waveform, Inc.
Winslow Co.

CIRCUITS GRAPHIC, including Printed Electric, Stamped, Etched, and Components

ACF Electronics
Aerovox Corp.
Airborne Instruments Lab.
Alden Products
Allied Engraving
Amelco, Inc.
Amer. Machine & Fdry.
Anderson Sons
Atlas E-E Corp.
Avion Div.
Bendix, Computer Div.
Cardwell Mfg. Co.
Centralab
Circon Component Co.
Cleveland Metal Specs.
Commun. Measmts. Lab.
Computer Co. of Amer.
Continental-Diamond Fibre

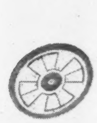
Sibley

PRECISION PRINTED CIRCUITS



RIGID DIMENSIONAL ACCURACY

REDESIGN of ASSEMBLIES for MINIATURIZATION



FINEST PRECIOUS METAL PLATING

Whether your problem is a new application or improvement of an existing one, for complete design, development and manufacture of Precision Printed Circuits consult:

THE SIBLEY CO.
Haddam, Conn.
Tel. Diamond 5-4501

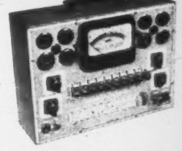
For more information circle 89 on inquiry card.

LABORATORY PRECISION at LOWEST COST with EICO!

SAVE 50% with EICO

46 KITS & Instruments

PERFORMANCE - PROVED on production lines of such TV leaders as Emerson, Majestic, Federal Telephone & Radio, Stromberg-Carlson, CBS-Columbia, etc.



TUBE TESTER #625 KIT $34.95
Factory-wired $49.95

R-C BRIDGE & R-C-L COMPARATOR #950B
KIT $19.95 Factory-wired $29.95

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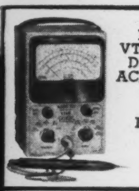
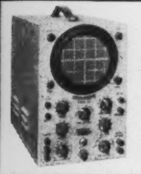
84 Withers St., Bklyn 11, N.Y.



Peak-To-Peak VTVM #232 with DUAL-PURPOSE AC/DC UNI-PROBE (pat. pend.)
KIT $29.95
Factory-wired $49.95



NEW COLOR & BLACK & WHITE LAB & TV SERVICE 5" SCOPE #460
KIT $79.95
Factory-wired $129.50

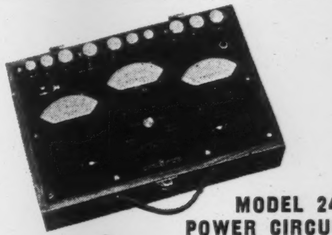
20,000 Ohms/Volt MULTIMETER #565
KIT $24.95
Factory-wired $29.95

SEE EICO at your neighborhood electronics distributor. WRITE for FREE Catalog C15
All Prices 5% Higher on West Coast

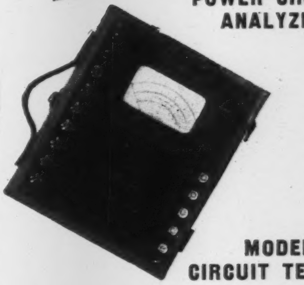
#324

150 kc—435 mc; 6 fund. bands.
NEW RF SIGNAL GENERATOR
KIT $26.95 Factory-wired $39.95

For more information circle 90 on inquiry card.



MODEL 247 POWER CIRCUIT ANALYZER

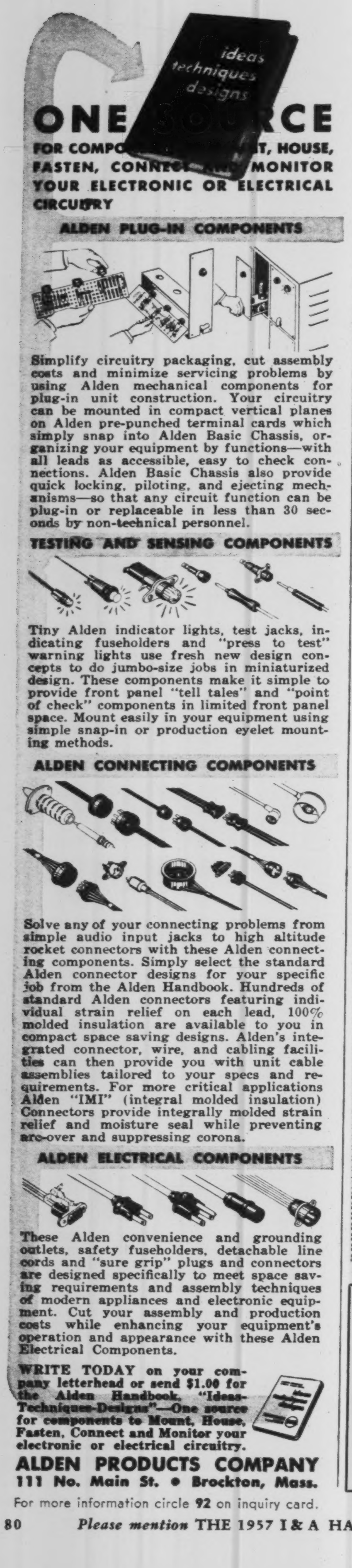


MODEL 102 CIRCUIT TESTER

- These instruments save time and expense in solving your circuit problems
- We design and manufacture all types of special electrical testing equipment.

INSTRUMENT LABORATORIES
327 W. Walton Pl., Chicago 10, Ill.

For more information circle 91 on inquiry card.



ideas techniques designs

ONE SOURCE

FOR COMPO T, HOUSE, FASTEN, CONN MONITOR YOUR ELECTRONIC OR ELECTRICAL CIRCUITRY

ALDEN PLUG-IN COMPONENTS

Simplify circuitry packaging, cut assembly costs and minimize servicing problems by using Alden mechanical components for plug-in unit construction. Your circuitry can be mounted in compact vertical planes on Alden pre-punched terminal cards which simply snap into Alden Basic Chassis, organizing your equipment by functions—with all leads as accessible, easy to check connections. Alden Basic Chassis also provide quick locking, piloting, and ejecting mechanisms—so that any circuit function can be plug-in or replaceable in less than 30 seconds by non-technical personnel.

TESTING AND SENSING COMPONENTS

Tiny Alden indicator lights, test jacks, indicating fuseholders and "press to test" warning lights use fresh new design concepts to do jumbo-size jobs in miniaturized design. These components make it simple to provide front panel "tell tales" and "point of check" components in limited front panel space. Mount easily in your equipment using simple snap-in or production eyelet mounting methods.

ALDEN CONNECTING COMPONENTS

Solve any of your connecting problems from simple audio input jacks to high altitude rocket connectors with these Alden connecting components. Simply select the standard Alden connector designs for your specific job from the Alden Handbook. Hundreds of standard Alden connectors featuring individual strain relief on each lead, 100% molded insulation are available to you in compact space saving designs. Alden's integrated connector, wire, and cabling facilities can then provide you with unit cable assemblies tailored to your specs and requirements. For more critical applications Alden "IMI" (integral molded insulation) Connectors provide integrally molded strain relief and moisture seal while preventing arc-over and suppressing corona.

ALDEN ELECTRICAL COMPONENTS

These Alden convenience and grounding outlets, safety fuseholders, detachable line cords and "sure grip" plugs and connectors are designed specifically to meet space saving requirements and assembly techniques of modern appliances and electronic equipment. Cut your assembly and production costs while enhancing your equipment's operation and appearance with these Alden Electrical Components.

WRITE TODAY on your company letterhead or send $1.00 for the Alden Handbook, "Ideas-Techniques-Designs"—One source for components to Mount, House, Fasten, Connect and Monitor your electronic or electrical circuitry.

ALDEN PRODUCTS COMPANY
111 No. Main St. • Brockton, Mass.

For more information circle **92** on inquiry card.

Cornell-Dubilier
Corning Glass Works
Daven Co.
Daystrom Instrument
Eastern Precision Resistor
Electronic Mechanics
Elektro-Serv Corp.
El Mec Labs.
Engineered Electronics
Engrg. Res. & Devel.
Erie Resistor
Farnsworth Electronics
Flett Lab.
Formica Co.
GE, Electronics Div.
General Instr. Co.
General Precision Lab.
Glass Prods. Co.
Graphik Circuits
Gudeman Co.
Gulton Mfg. Co.
Gurley, W. & L. E.
Hansen Electronics
Hastings-Raydist
Hausser & Son
Hycon Electronics
Insulated Circuits
Internat. Crystal Mfg.
Kay-Lab
Kearfott (Western)
Lab-Tronics
Lear, Inc.
Librascope, Inc.
Maryland Etching Co.
Mica Insulator Co.
Micro-Circuits
Miller Dial & Name Pl.
Motson Co., J. Frank
Mycalex Corp. of Amer.
PCA Electronics
Photo Chemical Prods.
Photocircuits Corp.
Pointed Electronics Corp.
R. S. Electronics
Raytheon Mfg.
Richardson Co.
Sanders Assocs.
Sequoia Process Corp.
Sibley Co.
Spaulding Fibre Co.
Sprague Electric
Stupakoff Div.
Sylvania Elect. Prods.
Techniques, Inc.
Topp Industries, Inc.
Torrance Glass & Color
Tri-Dex Electronics
Union Switch & Signal Co.
U. S. Engrg. Co.
Walkirt Co.
Westinghouse Electric

CIRCUITS and COMPONENTS, Plug-in

ACF Electronics
Aerovox Corp.
Alcor Electronics
Alden Products
Amer. Condenser Co.
Assembly Products
Authorized Mfrs. Service
Bendix, Pacific
Berkshire Labs.
Burroughs Corp.
Calif. Magnetic Cont. Corp.
Centralab Div.
Cleveland Metal Specs.
Computer Control Co.
Cutler-Hammer
Daven Co.
Dietz Design & Mfg.
Donner Scientific
Eldema Corp.
Engineered Electronics
Epsco, Inc.
Femco, Inc.
George-Held, Inc.
Graphik Circuits Div.
Gudeman Co.
Gulton Mfg. Corp.
Hermetic Sealing Corp.
Hi-Q Div.
Industrial Electronics
Interelectronics Corp.
L & O Res. & Devel.
Lab-Tronics
Levinthal Electronics Prods.
Librascope, Burbank Div.
Monroe Calculating Mach.
Motson Co. J. Frank
Nelson Instr. Co.
North Electric
North Amer. Philips
Opad Electric
PCA Electronics
Philbrick Researches
Phoenix Prec. Instr.
Probescope Co.
Radiation Inc.
Remler Co.
R. S. Electronics
Sanders Assocs.
Servomechanisms, Inc.
Shepard Labs.
Sibley Co.
Sparton Cont. Systems
Sprague Electric
Std. Elect. Time Co.
Superex Electronics
Technical Devel. Corp.
Technical Electronics Corp.
Tobe Deutschmann Corp.
Transval Engrg. Corp.
Tri-Dex Electronics
Ultrasonic Corp.
Universal Atomics Corp.
Vector Electronic Co.
Vectron, Inc.
Virginia Electronics
Walkirt Co.
Westronics, Inc.

CIRCUITS, Potted, including Embedded Components

Aerolite Electronics
Aerovox Corp.
Ahrendt Instr. Co.
Airflyte Electronics Co.
Alcor Electronics Corp.
Alden Products
Amelco, Inc.
Avion Div.
Calif. Magnetic Cont. Corp.
Centralab Div.
Computer Control Co.
Daven Co.
Farnsworth Electronics
Graphik Circuits
Gudeman Co.
Interelectronics Corp.
Jacobs Instr. Co.
Librascope, Burbank Div.
Magnavox Co.
Mann Co., Wm. I.
Natl. Aircraft Corp.
Opad Electric
PCA Electronics
RHO Engrg. Co.
Remler Co.
Sanders Assocs.
Sibley Co.
Sprague Electric
Torwico Electronics, Inc.
Transval Engrg. Corp.
Tri-Dex Electronics
Univ. Atomics Corp.
U. S. Gasket Co.
Virginia Electronics
Walkirt Co.
Wheeler Insul. Wire, Inc.
Whitney Blake Co.

CLAMPS, Cable, Conduit, Tube

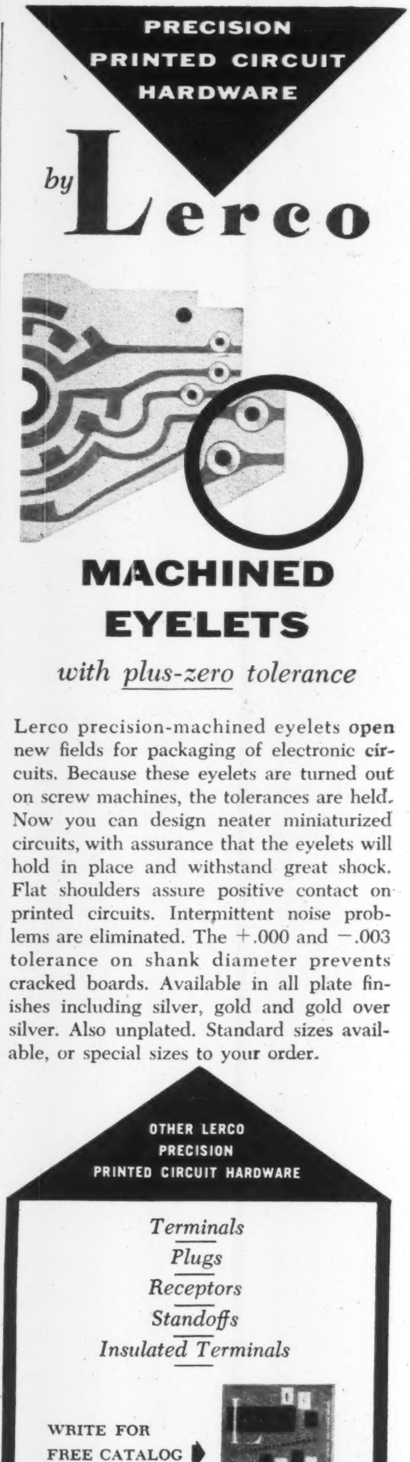
Amphenol Electronics
Aerolite Electronics
Atlas E-E Corp.
Breeze Corporations
Birnbach Radio
Brit. Electronic Sales
Buchanan Electcl. Prods.
Cannon Electric
Federal Screw Prods.
GE
Goodrich, Co., B. F.
Grammes & Sons
Insuline Corp. of Amer.
Kellogg Switchboard
Kulka Electric
Lewyt Metal Prods.
Millen Mfg. Co.
Molded Insulation Co.
Parker Appliance Co.
PIC Design Corp.
Pyle-National
Reliable Electric
Sittler Corp.
Thomas Assocs.
Tinnerman Products
States Co.
Unistrut Products
Weckesser Co.
Whitehead Stamping

CLEANERS, Air, see Air Cleaners, Dryers

CLEANING COMPOUNDS for Instruments

Alconox, Inc.
Bendix, Pioneer-Central
Carbide & Carbon
Chicago Apparatus
Cobehn, Inc.
Cooper & Co.
Daigger & Co.
Dow Chemical
DuPont
Fisher Scientific
Gallien, R. P.
Good, Inc., James
Hamilton Watch
Harshaw Chemical
Krembs & Co.
L & R Mfg.
Marshall Co.
Martindale Electric
Microcircuits Co.
Moore Corp., John B.
Protective Coatings
Superex Electronics
Wagner Co.
Zenith Mfg.
Zophar Mills, Inc.

When using this Guide, look under the variable, e.g., Pressure Gages (not Gages, Pressure); or look under the noun—Magnets, Permanent (not Permanent Magnets).



PRECISION PRINTED CIRCUIT HARDWARE

by Lerco

MACHINED EYELETS

with plus-zero tolerance

Lerco precision-machined eyelets open new fields for packaging of electronic circuits. Because these eyelets are turned out on screw machines, the tolerances are held. Now you can design neater miniaturized circuits, with assurance that the eyelets will hold in place and withstand great shock. Flat shoulders assure positive contact on printed circuits. Intermittent noise problems are eliminated. The +.000 and −.003 tolerance on shank diameter prevents cracked boards. Available in all plate finishes including silver, gold and gold over silver. Also unplated. Standard sizes available, or special sizes to your order.

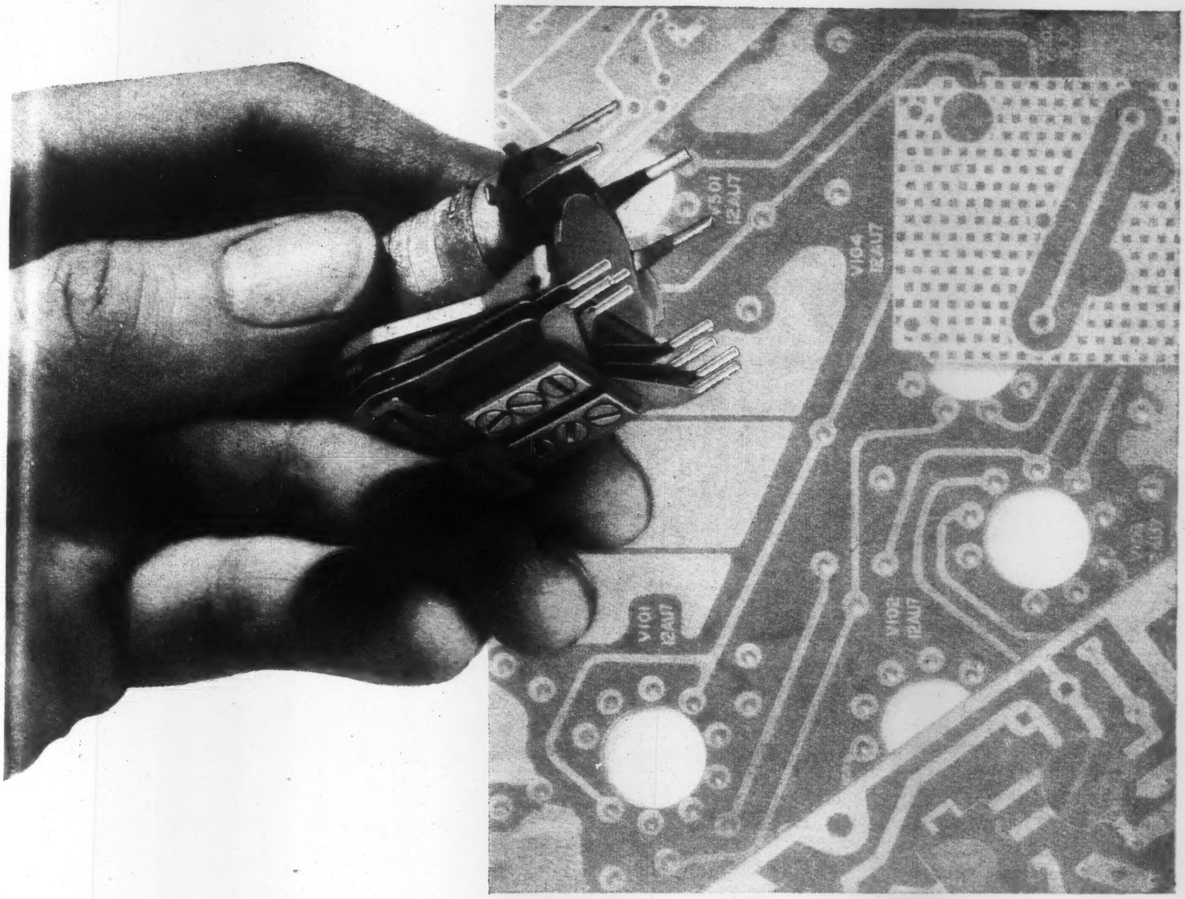
OTHER LERCO PRECISION PRINTED CIRCUIT HARDWARE

Terminals
Plugs
Receptors
Standoffs
Insulated Terminals

WRITE FOR FREE CATALOG

Lerco
ELECTRONICS, INC.
501 S. Varney, Burbank, Calif. Phone: VI. 9-5556

For more information circle **93** on inquiry card.



NOW!

dependable relays for printed circuits

Maybe you, too, have been awaiting availability of a *good* relay for direct insertion into printed circuits. Now Automatic Electric can solve your problem with a miniature relay that is just right.

120 million operations, without a single readjustment or relubrication! That's what you get from this rugged, improved Series SQPC Relay, because it features a special *heavy-duty* bearing and bearing pin. Also a recess in the bearing plate retains an adequate supply of lubricant for long-term lubrication of the bearing pin.

Consider these additional advantages:

1. The sections of the terminals that insert into the printed circuit board are NOT brazed or welded into place, but are integral parts of the coil terminals and contact springs—thus preventing internal loss in conductivity or continuity.
2. Terminal design permits direct plug-in of the relay into a printed circuit board, ready to be secured in place with any acceptable soldering technique.

Usually the desired contact spring combination, or pile-up, is sufficiently large so that additional mounting (support) of the relay is not necessary.

SQPC Miniature Printed Circuit Relays are available with many different contact spring arrangements, and for a multitude of applications. Springs can be made of phosphor-bronze, "Bronco" metal, or other special-purpose materials, as required.

Of course the long life, heavy-duty features of the improved SQPC Relay can be had in the conventional type of plug-in relay, if regular sockets are preferred for use, whether in printed circuitry or other applications.

To get complete details, write: Automatic Electric Sales Corporation, 1033 West Van Buren St., Chicago 7, Illinois. *In Canada:* Automatic Electric (Canada) Ltd., Toronto. *Offices in principal cities.*

AUTOMATIC ELECTRIC

Originators of the dial telephone • Pioneers in automatic control

GENERAL SYSTEM

For more information circle **94** on inquiry card.

ULTRASONIC CLEANING

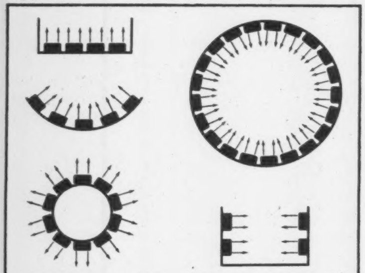
BY THE SQUARE FOOT

Recent improvements in ultrasonic power-generating equipment, and the perfection of hermetically-sealed transducers operating at 40 kc/sec, have now made it economically feasible to apply ultrasonic cleaning to areas measured by the square foot. Up to now, cost and technical problems have largely confined the benefits of this fast and efficient technique to relatively small units.

The large, uniform radiating surface of the transducers makes them particularly suitable for the removal of buffing compounds, radioactive contamination, soldering flux, plaster, carbon smut, etc. The transducers can also be used for other processes such as quenching, plating, pickling, descaling and dyeing. The cleaning action penetrates deeply into blind holes and other areas difficult or impossible to clean by conventional methods.

The Branson LF-15 Transducers have a radiating surface 2⅝" x 6", with thick barium-titanate driving elements that transmit the energy through the top of the stainless-steel housing directly into the cleaning solvent. The modular design of the transducers facilitates a wide choice of flush and focused arrangements of transducers.

Typical Transducer Arrangements



Generator-Transducers combinations are available with radiating areas from ¼ to 10 square feet:

SONOGEN® MODEL	TRANSDUCER CLEANING AREA
AP-25	¼ Sq. Ft.
APT-100	1
APT-400	4
P-1000	10

Cost of complete equipment, per square inch of radiating surface, ranges from $23 down to $14. We will be happy to send you complete information on request.

Specializing in
Ultrasonics
since 1946

BRANSON ULTRASONIC corp.
3 BROWN HOUSE ROAD · STAMFORD · CONNECTICUT

For more information circle **95** on inquiry card.

CLEANING MACHINES, Instrument, including Vapor Degreasers, Detergent and Ultrasonic

Aeroil Burner
Bendix, Pioneer Central
Bendix-Pacific
Bethlehem Apparatus
Branson Instruments
Carbide and Carbon
Circo Equipt. Co.
Cobehn, Inc.
Eastern Specialty Co.
Gallien, R. P.
General Ultrasonics
Hagan Corp.
Jerguson Gage
L & R Mfg.
Lennard Co., P. M.
Marshall Co.
Massa Labs.
Micro-Metric Instr. Co.
Moore Corp., John B.
Naxon Utilities
Nestor Engrg. Co.
Passaic Anal. Labs.
Phillips Mfg.
Raytheon Mfg.
Zenith Mfg.
Zophar Mills, Inc.

CLINOGRAPHS, Bore Hole

Georator Corp.
Sperry-Sun Well Surveying

CLINOMETERS for Determining Ceiling Height of Clouds

Alden Products
Alfax Paper & Engrg.
Dietzgen Co.
Geier & Bluhm
Leeds & Northrup
Stoelting Co.
White Co., Inc., David

CLINOMETERS, Angular Measuring

Dietzgen Co.
Engis Equipt. Co.
Ercona Corp.
Ferner Co.
Geier & Bluhm
Jarrell-Ash
Keuffel & Esser
Leupold & Stevens
Meyer-Opticraft
Moeller Instr. Co.
Negus, T. S. & J. D.
Opplem Co., Inc.
Prec. Thermom. & Insts.
Rahm Instr. Inc.
Sperry-Sun Well Surveying
Warren-Knight

CLINOMETERS, Geologists

Garlynn Engrg. Co.
Jarrell-Ash
Keuffel & Esser
Stratex Instr. Co.

CLINOMETERS, Ship

Eastern Specialty Co.
Engis Equipt. Co.
Geier & Bluhm
Hand & Sons
Instruments Corp.
Marine Compass Co.
Moeller Instr. Co.
Negus, T. S. & J. D.
Prec. Thermom. & Insts.
Rahm Instr. Inc.
Serdex, Inc.

CLIPS, Battery (see also Connectors)

Aerolite Electronics
Associated Spring Corp.
Cambridge Thermionic
Eastern Specialty Co.
Elect, Auto-Lite
Federal Screw Prods.
Grammes & Sons, Inc.
Insuline Corp. of Amer.
Kellogg Switchboard
Mueller Electric
National Tel-Tronics
Rodale Mfg.
Smith, Inc., Herman H.
States Co.
Stimpson Co.

CLIPS, Fahnestock

Birnbach Radio
Clarostat Mfg.
Federal Screw Prods. Co.
Grammes & Sons
Insuline Corp. of Amer.
Rodale Mfg.
Smith, Inc., Herman H.
Stimpson Co.

CLIPS, Fuse, Grid, Test

Aerolite Electronics
Alden Products
Associated Spring Corp.
Atlas E-E Corp.
Birnbach Radio
Eastern Specialty Co.
Federal Screw Prods.
Grayhill, Inc.
Insuline Corp. of Amer.
Kulka Electric
Martindale Electric
Miller Mfg.
Natl. Tel-Tronics
Raytheon Mfg.
Smith, Inc., Herman H.

CLOCK PARTS

Alina Corp.
Allied Prods. Div.
Amer. Laubscher
Associated Spring Corp.
Bayside Watch Tool Co.
Chelsea Clock
Chicago Thrift Etching
Cincinnati Time Rec. Co.
Dollin Corp.
Elgin Natl. Watch
Gallien, R. P.
Grammes & Sons
Gries Reproducer Corp.
Hairspring Vibrating
Hartford Mach. Screw Co
Howard Clock
Instrument Parts Corp.
Internat. Business Machs
Jadow Inc., B.
Jessup Engrg. & Devel.
Johnson Eng. Co., W. V.
Leich Electric
Lux Clock
Manross & Sons
Marshall Co.
Marsco Mfg.
Merkle Korff Gear Co.
Modern Techn. Supp.
National Time & Signal
New Haven Clock
Photo Chemical Prods.
Precision Mfg. Co.
Precision Prods. Co.
Preco Co.
Rueckert Mfg.
Scovill Mfg.
Seth Thomas Clocks
Spaulding Fibre Co.
Specialty Screw Mach.
Sphinx American
Std. Automation Prods.
Std. Elect. Time Co.
Steel Co., Herman D.
Stimpson Co.
Swiss Amer. Jewel-Bear.
Swiss Jewel Co.
Swissomatic Products
Thompson Clock
Tinnerman Products
Tork Clock
Torrington Co.
Vallorbs Jewel
Waltham Screw Co.
Waples, W. S.
Wilder, Inc.
Winn, Inc.

CLOCKS, Master or Primary

Alina Corp.
Allied Products Div.
Bendix, Eclipse-Pioneer
Chelsea Clock
Cincinnati Time Rec. Co.
El Products Corp.
Elgin National Watch
Gaertner Scientific
GE, Telechron Dept.
General Radio
Internat. Business Machs.
Jacobs Instr. Co.
Jessup Engrg. & Dev. Co.
Landis & Gyr
National Time & Signal
New Haven Clock
Parsons Co.
Phipps & Bird
Research Controls
Simplex Time Rec. Co.
Std. Elect. Time Co.
Stromberg Time Corp.
Thomas Clock
Wallace & Tiernan

CLOCKS, Minute Impulse and Synchronous

Alina Corp.
Amglo Corp.
Betts & Betts
Bristol Co.
Chelsea Clock
Cincinnati Clock
Cincinnati Time Rec. Co.
Cramer Controls Corp.
Elect. Tachom. Corp.
Electyme Motor Prods.
Elgin Natl. Watch
GE, Apparatus Sales
GE, Telechron Dept.
Hansen Co.
Haydon Co., A. W.
Haydon Mfg. Co.
Internat. Business Machs
Lafayette Instr. Co.
Landis & Gyr.
Lumenite Electronic
Lux Clock
National Time & Signal
New Haven Clock
Phipps & Bird
Sessions Clock
Simplex Time Rec. Co.
Std. Elect. Time Co.
Stoelting Co.
Stromberg Time Corp.
Thomas Clock
Thompson Clock
Tork Clock
Westinghouse Electric

CLOCKS, Program, see Timers, Automatic Process, also Program Controllers

CLOCKS, Secondary

Alina Corp.
Allied Prods. Div.
Automatic Electric
Bristol Co.
Cincinnati Time Rec. Co.
Elgin Natl. Watch
GE, Telechron Dept.
Internat. Business Machs.
Internat. Std. Trading
Landis & Gyr.
National Time & Signal
New Haven Clock
Simplex Time Rec.
Std. Elect. Time Co.
Stromberg Time Corp.
Thomas Clock
Wallace & Tiernan

CLOCKS, Standard

Alina Corp.
Aristo Import Co.
Chelsea Clock
Cincinnati Clock
Cincinnati Time Rec. Co.
Foxboro Co.
Gaertner Scientific
GE. Telechron Dept.
General Radio
Hansen Co.
Haydon Mfg. Co.
Internat. Business Machs.
Jaeger Watch
Kollsman Instr. Corp.
Lux Clock
Natl. Time & Signal
Negus, T. S. & J. D.
New Haven Clock
Research Controls
Rockwell Register Corp.
Seth Thomas Clock
Simplex Time Rec. Co.
Std. Elect. Time Co.
Stromberg Time Corp.
Swanson Engrg. Co.
Tork Clock

CLOCKS, Stop

Allied Prods. Div.
Atomlab, Inc.
Burke & James
Central Scientific
Clebar Watch
Controls Corp.
Cramer Controls Corp.
Dimco-Gray
Electrosig Corp.
Elgin Natl. Watch
Fish-Schurman
GE. Telechron Dept.
Glogau & Co.
Haydon Co., A. W.
Jaeger Watch
Jardur Import Co.
Lafayette Instr. Co.
Lux Clock
National Time & Signal
Negus, T. S. & J. D.
New Haven Clock
Phila. Scientific Glass
Precision Scientific
Sessions Clock
Std. Elect. Time Co.
Stlicht Co., Herman H.
Stoelting Co.
Thompson Clock
Welch Mfg. Co., W. M.
Weston Electcl. Instr.

CLOCKWORKS, Electric, including Instrument Drives

Alina Corp.
Anglo Corp.
Bristol Co.
Bristol Motor Div.
Cramer Controls Corp.
Duplex Clock
Edin Co.
Electric Tachom. Corp.
El Prods. Corp.
Elsbert Mfg.
Esterline-Angus
Fairchild Camera
GE. Telechron Dept.
Hagen Mfg.
Hansen Mfg.
Hathaway & Associates
Haydon Co., A. W.
Haydon Mfg. Co.
Holtzer-Cabot
Howard Clock
Illinois Coil Spring
Induction Motors Corp.
Ingersoll-Waterbury
Insco Company
Instrument Gear Works
Internat. Business Machs.
Kurman Electronics
Landis & Gyr
Leich Electric
Lux Clock
Merkle Korff
Modern Technical Supp.
Natl. Time & Signal
New Haven Clock
Phipps & Bird
Seth Thomas Clocks
Std. Elect. Time Co.
Swissomatic Products
Thompson Clock
Tork Clock
Vocaline Co. of Amer.

CLOCKWORKS, Mechanical including Instrument Drives

Alina Corp.
Allied Prods. Div.
Bayside Watch Tool Co.
Bodine Electric
Borel & Co.
Breeze Corporations
Bristol Co.
Bristol Motor Div.
Chelsea Clock
Cramer Controls Corp.
Duplex Clock
Edin Corp.
El Prods. Corp.
Electric Tachom. Corp.
Elgin Natl. Watch
Esterline-Angus
Ford Instr. Co.
Haydon Mfg.
Howard Clock
Hunter Spring Co.
Ingersoll-Waterbury
Insco Company
Instr. Gear Works
Internat. Business Machs.
Janette Mfg.
Kollsman Instr. Div.
Lux Clock
Magnavox Co.
Merkle Korff Gear Co.
New Haven Clock
lumb Co.
Research Devel. Mfg.
Rockwell Mfg.
Seth Thomas Clocks
Smith Mach. Co.
Std. Elect. Time Co.
Steel Co., Herman D.
Stow Mfg. Co.
Swissomatic Products
Thompson Clock
Wilder Inc.

CLOCKWORKS, Pneumatic, including Instrument Drives

Alina Corp.
Bodine Electric
Breeze Corporations
Cramer Controls Corp.
Dahl Co., Inc., G. W.
Edin Corp.
Electric Tachom. Corp.
Esterline-Angus
Ford Instr. Co.
Haydon Mfg.
Hunter Spring Co.
Instr. Gear Works
Janette Mfg.
Kollsman Instr. Div.
Merkle-Korff Gear Co.
Gear Co.
Rockwell Mfg. Co.
Stow Mfg.
Thompson Clock
Wilder Inc.

CLOSURES, PRESSURE, see Seals, Mechanical

CLOTH, Wire

Chase Brass & Copper
Jelliff Mfg. Co.
Michigan Wire Cloth
Roebling's Sons

CLOUD AND POUR TEST APPARATUS

Ace Glass Inc.
Amer. Instr. Co.
Amer. Research
Bellco Glass Corp.
Blue M Electric
Bowser Techn. Refr. Dir.
Central Scientific
Corning Glass Works
Environmental Equipt. Co.
Fisher Scientific
Greiner Co., Emil
Humboldt Mfg. Co.
Koehler Instr. Co.
Kontes Glass
Labline, Inc.
Moeller Instr. Co.
New Haven Clock
Precision Scientific
Refinery Supply Co.
Refrigeration Systems, Inc.
Scientific Instr. Co.
Scientific Instr. Dev. Labs.
Scientific Glass App.
Technical Equipt. Co.
Temp. Engrg. Corp.
Tenny Engrg. Co.
Weston Electcl. Instr.

COAL TEST INSTRUMENTS and APPARATUS

Amer. Instr. Co.
Bailey Meter Co.
Burrell Corp.
Central Scientific
Cuthbert Co.
Elematic Equipt. Corp.
Emerson App. Co.
Fish-Schurman
Fisher Scientific
G. M. Mfg. Co.
Hetherington & Berner
Laboratory Equipt. Corp.
Nuclear Research
Parr Instr. Co.
Precision Scientific
Radio City Prods.
Riehle Div.
Sargent & Co.
Sturtevant Mill
Technical Equipt. Co.
Testing Machines, Inc.

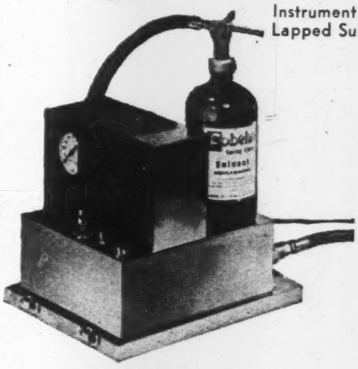
COATINGS, Synthetic Resin

Acme Wire Co.
Bakelite Div.
Biggs Co.
Carbide & Carbon
Chicago Thrift Etching
Dolph, John C., Co.
Dow Chemical
DuPont
Durez Plastics & Chem.
Durite Plastics
Emerson & Cuming
Goodrich Co., B. F.
Insulation Mfrs.
Lawter Chemicals
Mica Insulator
Micro-Circuits
Minnesota Mining & Mfg.
Monsanto Chemical
Moore & Co., Samuel
Moore Corp., John B.
Penfield Mfg. Co.
Polymer Corp.
Sauereisen Cement
Sherwin-Williams
Sullivan Varnish
United Chromium
U. S. Rubber
Werner Co., R. D.
Zophar Mills

COCKS, Glass

Corning Glass Works
Fischer & Porter Co.
Fish-Schurman
Glasscraft Co.
Nester Co.
Owens-Illinois
Phoenix Prec. Instr.
Porter, George K.
Prec. Glass Prods.

Critically Cleans
Cobehn



ELECTRONIC COMPONENTS and ASSEMBLIES:
Vacuum Tube Components; Diodes and Transistors; Slip-Ring Commutators; Crystals; Sub-Miniature Assemblies

METER and INSTRUMENT COMPONENTS:
Instrument Bearings; Jewel Bearings and Pivots; Gear Trains; Lapped Surfaces

ELECTRICAL CONTACTS:
Relays, Vibrators, Voltage Regulators, Sensitive Switches

Cobehn High-Velocity Spray-Clean Technique
REMOVES: Rosin Flux; Silicone Lubricants; Oil, Grease and Wax; Lapping Compound and Abrasives; Dirt, Dust and Lint
SAFELY: No Film or Residue; No Corrosive Effect; No Damage to Surface; No Fire or Explosion Hazard; Non-Polar and Non-Ionic

Write for Descriptive Literature

Visit BOOTH 531
3rd International Automation Exp.
New York—Nov. 26-30.

Cobehn, Inc.
126 PASSAIC AVE.,
CALDWELL, N. J.

For more information circle 96 on inquiry card.

COCKS, Metal

Accesory Prods. Corp
Conant Bros. Co.
Continental-Diamond Fibre
Dole Valve Co.
Hays Mfg. Co.
Hubbell Metals
Jerguson Gage
Parker Appliance Co.
Precision Scientific
Stafford Co.
Steel Co., Herman D.
Trerice Co.
Vacuum Electronics Engrg.
Weatherhead Co.
Weksler Thermom. Corp.
Westinghouse Air Brake Co.

CODING EQUIPMENT, see Telegraphy

COHESION TESTING MACHINES, Silk and Rayon, see Silk and Rayon Test Instruments

COIL FORMS, Ceramic and/or Plastic

Alden Products
Amer. Lava Corp.
Amer. Phenolic Corp.
Cambridge Thermionic
Centralab Div.
Continental-Diamond Fibre
Corning Glass Works
Crane Packing Co.
Electronic Mechanics, Inc.
Ford Instr. Co.
Formica Co.
Garde Mfg.
General Ceramics
GE
General Transf. Co.
General Winding Co.
Grayhill, Inc.
Gries Reproducer Corp.
Insuline Corp. of Amer.
Insulation Mfrs. Corp.
Johnson Co., E. F.
Micalex Corp. of Amer.
Millen Mfg. Co.
Molded Insulation Co.
Mycalex Corp. of Amer.
North Hills Electric
Polymar Corp.
Prec. Paper Tube Co.
Printloid. Inc.
Rex Corp.
Richardson Co.
Rogan Bros.
Shallcross Mfg.
Spaulding Fibre Co.
Speer Carbon Co.
Stackpole Carbon Co.
Steatite Div.
Steward Mfg. Co.
Stupakoff Div.
Superex Electronics

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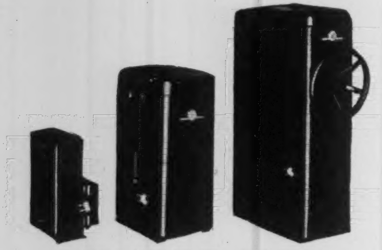
For more information circle 97 on inquiry card.



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CONTROL DRIVES

● These air-operated power units provide precise positioning of regulating devices such as dampers, butterfly valves, hydraulic couplings and feeders in accordance with a pneumatic control signal.

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AC816P	1500	90°
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Type	Force (lb)	Linear Travel
AC1030P	1600	30 in.
AC1260P	2500	60 in.

Request Product Specification P81-1 for Control Drives and Product Specification P81-5 for control linkage.

BAILEY METER COMPANY
1041 IVANHOE ROAD CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For more information circle **98** on inquiry card.

Superior Steatite
Telex, Inc.
Thordarson-Meissner
United States Electronics
Viking Electric
Watertown Mfg.

COIL TESTING EQUIPMENT

Assoc. Research Inc.
B & K Mfg.
Biddle Co., James
Boonton Radio Co.
California Magnetic
Clippard Instr. Lab.
Clough-Brengle
Columbia Technical Corp.
Daystrom Instrument
Diatron Co.
Electronic Instr. Co.
Feiler Engrg. Co.
Freed Transf. Co.
GE, Apparatus Sales
General Electronic
General Radio
Ideal Industries
Industrial Insts., Inc.
Indust. Test Equipt.
Instrument Labs.
Kahn & Co.
Kay Electric
Kellogg Switchboard
Magnetic Instr. Co.
Martindale Electric
Pacific Instr. Co.
Panoramic Radio Co.
Radex Corp.
Radio City Products
Reiner Electronics
Rubicon Co.
Schauer Mfg.
Sherron Metallic Corp.
Sun Electric
Sunshine Scientific
Technology Instr. Div.
Thordarson Meissner
United Optical
United Transf. Corp.

COIL WINDING MACHINES, see Machines, Coil Winding

COILS RF and IF

Aerolite Electronics
Aerovox Corp.
Boonton Radio
Airpax Products
Bud Radio
Calif. Magnetic Cont. Corp.
Cambridge Thermionic
Carad Corp.
Corning Glass Works
Dietz Design & Mfg.
Dittmore & Freimuth
Eastern Prec. Resistor
General Instr. Co.
Gordos Corp.
Goslin Electric
Gramer Transformer
Gudeman Co.
Johnson Co., E. F.
Magnavox Co.
Magnetic Instr. Co.
Mallory & Co., P. R.
Millen Mfg. Co.
Natl Aircraft Corp.
North Hills Electric
Ohmite Mfg. Co.
Osborne Electric
Polyphase Instr. Co.
Sickles Div.
Speer Carbon Co.
Superex Electronics
Tri-Dex Electronics
United States Electronics
Virginia Electronics
Wirt Co.

COILS, Toroidal

Aerolite Electronics
Aerovox Corp.
Ahrendt Instr. Co.
Airpax Products
Alden Products
Arnold Magnetics Co.
Atlantic Transf. Div.
Avion Div.
Brit. Electronic Sales
Burnell & Co.
Caledonia Electronics
Carad Corp.
Chicago Standard Trans.
Colin Campbell Co.
Communication Access. Co.
Control Components Co.
Dietz Design & Mfg.
Dittmore Freimuth
DuMont Labs., Allen B.
Ford Instrument
Freed Transformer
General Instrument
Goslin Elect. & Mfg. Co.
Gramer-Halldorson Transf.
Hycor Co., Inc.
Jeffries Transf. Co.
Kearfott Co.
Lenkurt Electric
Magnavox Co.
Magnetic Instr. Co.
Mechaponents Div.
Mico Instr. Co.
Natl. Aircraft Corp.
Osborne Electric
PCA Electronics
Polyphase Instr. Co.
Raytheon Mfg. Co.
Sickles Div.
Southw. Indust. Electronics
Std. Electric Prods.
Terwico Electronics
Texas Insts., Inc.
Transformers, Inc.
Transmag Div.
Triad Transf. Corp.
Tri-Dex Electronics
United States Electronics
United Transf. Corp.
Vari-L Co., Inc.
Wang Labs.
Wheeler Insul. Wire

COILS, Transformer

Acme Wire Co.
Aerovox Corp.
Airpax Products
Altec Lansing
Amplifier Co. of Amer.
Atlantic Transf. Div.
Avion Div.
Cambridge Thermionic
Carad Corp.
Caledonia Electronics
Calif. Magnetic Cont. Corp.
Carol Electronics
Chicago Std. Transf. Corp.
Clippard Instr. Lab.
Comar Electric
Control Components Co.
Cooper Co., Clark
Dano Electric
Dietz Design & Mfg.
Dinion Coil Co.
Dittmore & Freimuth
Dormeyer Industries
Durakool, Inc.
Eastern Specialty Co.
Electricoil Transf.
Electronic Transf. Co.
Essex Wire Co.
Ferrandi Electric
Freed Transf. Co.
Gordos Corp.
Goslin Electric
Gramer-Halldorson Transf.
Harris Co., Arthur
Hevi-Duty Electric
James Vibrapowr Co.
Jeffries Transf. Co.
Lenkurt Electric
Magnatran Inc.
Magnavox Co.
Magnetic Instr. Co.
Mechaponents Div.
Merit Transf. Corp.
Mt. Sopris Instr. Co.
NYT Electronics
Natl. Aircraft Corp.
Nothelfer Winding Labs.
North Hills Electric
P. C. A. Electronics
Polyphase Instr. Co.
Reed & Reese
Small Motors, Inc.
Sorensen & Co.
Southw. Indust. Electronics
Specialties, Inc.
Spellman Television
Std. Electrical Prods.
Sterling Transf. Corp.
Telex, Inc.
Texas Insts., Inc.
Thordarson-Meissner
Transvision, Inc.
Triad Transf. Corp.
United States Electronics
United Transf. Corp.
Universal X-Ray Prods.
Westinghouse Electric
Wheeler Insul. Wire
Wirt Co.

COIN OPERATED DEVICES

Transvision, Inc.

COLLIMATORS, Vertical

Amer. Optical
Berger & Sons
Davidson Mfg. Co.
Dusenbery Co.
Edmund Scientific
Engis Equipt. Co.
Fecker, Inc.
Fish-Schurman
Gaertner Scientific
Garlynn Engrg. Co.
Georator Corp.
Gordon Enterprises
Jacobs Instr. Co.
Kollsmann Instrument
Laboratory Optical
Lindly & Co.
Link Aviation Devices
Los Angeles Scientific
Mann Co.
Meyer-Opticraft
Nife Inc.
Norden-Ketay
Palos Optical
Pan-Technics, Ltd.
Perkin-Elmer
Phoenix Prec. Instr.
QOS Corp.
Stocker & Yale
Testa Mfg. Co.
Unertl Optical
White Co. Inc.
Wild Heerbrugg
Zoomar Corp.

COLOR ANALYZERS and COMPARATORS, Photoelectric

Allied Engrg. Div.
Amer. Electronic Labs.
Amer. Optical
Ansco
Applied Physics Corp.
Applied Research Labs.
Avion Div.
Bausch & Lomb
Beckman Div.
Berkshire Labs.
Central Scientific
Coleman Insts.
Dearborn Scientific
De-Tec-Tronic Labs.
Electric Sorting Mach. Div.
Electronic Control Corp.
Ercona Corp.
Ess Instr. Co.
Farrand Optical
Fish-Schurman
Fisher Scientific
Gaertner Scientific
Gardner Laboratory
G.E., Apparatus Sales
General Radio
Hallikainen Instruments
Hellige, Inc.
Huggins Labs.
Instrument Devel. Labs.
Jacobs Instr. Co.
Jarrell-Ash
Kaye Dev. Co.
Klett Mfg. Co.
Laboratory Optical
Lafayette Instr. Co.
Librascope Inc.
Macbeth Corp.
Madison Elect. Prods.
Meyer-Opticraft
Pfaltz & Bauer
Phoenix Prec. Instr. Co.
Photo Res. Corp.
Photobell Co.
Photoswitch, Inc.
Photovolt Corp.
Precise Measurements
Process & Instruments
Rawson Elect. Instr.
Rubicon Co.
Tarc Electronics Inc.
Telechrome, Inc.
Testing Machines, Inc.
Wallace & Tiernan
Welsh Mfg. Co., W. M.
Westinghouse Electric
Willmotte, Inc.
Zeiss, Inc., Carl

COLOR COMPARATORS, Visual

Allied Engrg. Div.
Atlas Electric Devices
Austin Co.
Baird Assocs.-Atomic Instr.
Bausch & Lomb
Central Scientific
ConRay Corp.
Electric Eye Equipt.
Electric Sorting Machine
Ercona Corp.
Fisher Scientific
Gaertner Scientific
Gardner Laboratory
GE, Instr. Dept.
Hallikainen Instruments
Hausser & Son
Hellige, Inc.
Huggins Labs.
Instrument Devel. Labs.
International Devel. Co.
Jackson Electcl. Instr.
Jarrell-Ash
Kay Electric
Kaye Devel. Co.
Klett Mfg.
Koehler Instr. Co.
LaMotte Chemical Prods.
Librascope, Inc.
Macbeth Corp.
Menlo Research Lab.
Munsell Color Co.
Penn Optical & Instr.
Phipps & Bird
Phoenix Prec. Instr.
Photovolt Corp.
Precise Measmts. Co.
Rascher & Betzold
Shasta Div.
Sheffield Corp.
Stoelting Co.
Swedish Gage
Taylor & Co., W. A.
Telechrome, Inc.
Testing Machines, Inc.
Wallace & Tiernan
Westinghouse Electric
Weston Electcl. Instr.
Zeiss, Inc., Carl

COLOR STANDARDS, see Standards, Color

COLORIMETER TUBES, see Colorimeters, Visual

COLORIMETERS, Photoelectric

Allied Engrg. Div.
Amer. Instr. Co.
Associated Research
Bausch & Lomb
Beckman Div.
Berkshire Labs.
Biddle Co., James G.
Brinkmann & Co.
Central Scientific
Clay-Adams
Coleman Instruments
Dearborn Scientific
De-Tec-Tronic Labs.
Electric Eye Equipt.
Ercona Corp.
Farrand Optical
Fish-Schurman
Fisher Scientific
Gardner Laboratory
G E, Instr. Dept.
Hallikainen Instruments
Hellige, Inc.
Huggins Labs.
Instrument Devel. Labs.
Jarrell-Ash Co.
Kaye Devel. Co.
Klett Mfg. Co.
Kruger Instruments
Leitz, Inc.
Macbeth Corp.
Mass Instruments
Meyer-Opticraft
Munsell Color
Phoenix Prec. Instr.
Photovolt Corp.
Photron Instr. Co.
Process Instruments
Rubicon Co.
Scientific Glass App.
Technical Prods. Co.
Telechrome, Inc.
United Optical
Will Corp.
Zeiss, Inc., Carl

COLORIMETERS, Visual

Allied Engrg. Div.
Amer. Instr. Co.
Amer. Optical
Bausch & Lomb
Bellco Glass Inc.
Central Scientific
Coleman Instr. Co.
Ercona Corp.
Fischer & Porter Co.
Fish-Schurman
Fisher Scientific
Gardner Laboratory
Greiner Co., Emil
Hausser & Son
Helio Instr. Co.
Hellige, Inc.
Instrument Devel. Labs.
International Devel. Co.
Jarrell-Ash
Klett Mfg.
Koehler Instr. Co.
Kontes Glass Co.
Labline, Inc.
Munsell Color Co.
Opplem Co.
Phoenix Prec. Instr.
Precise Measmts. Co.
Precision Scientific
Rascher & Betzold
Taylor & Co., W. A.
Technical Prods. Co.
Weston Electcl. Instr.
Zeiss, Inc., Carl

COLUMBIUM

Belmont Smelt. & Ref.
Fansteel Metallurgical

COLUMNS, Ion Exchange, see Ion Exchange Columns

COMBUSTION CONTROL EQUIPMENT (see also Boiler Room Instruments, also Furnace Control)

Askania Reg. Co.
Assembly Products
Bailey Meter Co.
Barber-Colman
Beckman Div.
Bristol Co.
Brooke Engrg. Co.
Burrell Corp.
Cambridge Instr. Co.
Cash Co., A. W.
Cleveland Fuel Equipt.
Combustion Control Corp.
Continental Foundry
Copes Vulcan Div.
Cutler-Hammer
Davis Emergency Equipt.
De-Tec-Tronic Corp.
Eclipse Fuel Engrg. Co.
Electron-Radar Prods.
Electronic Prods. Co.
Electronics Corp. of Amer.
Ellison Draft Gage Co.
Engelhard, Inc., Chas.
Ess Instr. Co.
Fischer & Porter Co.
Fisher Governor
Foxboro Co.
Furst Electronics
Genl. Regulator Corp.
General Controls Co.
G E, Apparatus Sales
General Regulator Corp.
Gordon Co., Claud S.
Hagan Corp.
Hammel-Dahl
Hays Corp.
Jo-Bell Products
Lake Erie Electric
Larson Instr.
Leeds & Northrup
Mason-Neilan Div.
Mercoid Corp.
Mine Safety Appliances
Minneapolis-Honeywell
Moore Products
National Brass Co.
Natural Gas Equipt.
Partlow Corp.
Perfex Div.
Controls Div.
Reliance Instr. Mfg.
Republic Flow Meters
R.K.L. Valve & Mfg. Co.
Selas Corp.
Shallcross Controls
Smok-Trol Corp.
Soreng Products
Surface Combustion Corp.
Taylor Instr. Cos.
Victory Engrg. Corp.
Wheelco Instr. Div.
Worner Electronic Devices

COMBUSTION INDICATORS and/or RECORDERS, see Boiler Room Instruments, also Gas Analyzers

COMBUSTION SAFEGUARDS, Including Flame Failure

Assembly Products
Barber-Colman
Bristol Co.
Diamond Power Spec. Corp.
Dietz Co., Henry G.
Eclipse Fuel Engrg. Co.
Electron-Radar Prods.
Electronic Control Corp.
Electronics Corp. of Amer.
Ess Instr. Co.
General Controls Co.
Larson Instr. Co.
Mercoid Corp.
Minneapolis-Honeywell
Partlow Corp.

COMMUNICATION MEASURING INSTRUMENTS

Aircraft Radio
Alden Electronic
Alden Products
Alto Scientific
Amer. Electroneering
Amplifier Co.
Ark Engrg.
Automatic Electric
Avion Div.
Ballantine Labs.
Boonton Radio
Brunswick Instruments
Brush Electronics
Burlington Instr. Co.
Cal-Tronics Corp.
Clarke Instr. Corp.
Clough Brengle
Communications Meas. Lab.
Dale Instruments
Daven Co.
Daystrom Instrument
Donner Scientific
D & R Limited
Elect. Indicator Co.
Electric Des. & Mfg.
Electronic Assocs.
Electronic Devel. Lab.
Electronic Tube Corp.
Esterline-Angus
Federal Telephone & Radio
Feiler Engrg. Co.
Ferris Instr. Corp.
Freed Transf. Co.
GE
General Radio
Harvey Radio Labs.
Henschel Corp.
Hewlett-Packard
Hickok Electcl. Instr.
Hycon Mfg. Co.
Industrial Inst. Co .
Kahn & Co.
Kay Electric
Kellogg Switchboard
Leeds & Northrup
Lenkurt Electric
Manson Labs.
Marconi Instruments
Measurements Corp.
Microphase Corp.
Millen Mfg. Co.
New London Instr. Co.
Pacific Instr. Co.
Precision App. Co.
Premier Crystal Labs.
Raytheon Mfg. Co.
RCA Div.
Rubicon Co.
Scott, Inc., Hermon H.
Sensitive Research Instr.
Servo Corp. of Amer.
Shallcross Mfg.
Sherron Metalic Corp.
Sierra Electronic
Sound Apparatus
Sperry Gyroscope
Stafford Co.
Sylvania Elect. Prods.
Technology Instr. Div.
Thordarson-Meissner
Trimount Instr. Co.
Triplett Elect. Instr.
United Optical Mfg.
Vapor Recovery Systems
Vectron, Inc.
Virginia Electronics
WacLine, Inc.
West Coast Electronics
Westinghouse Electric
Weston Electcl. Instr.

COMPARATOR GAGES, see Dimensional Gages, Pneumatic, etc.

COMPARATORS, Electrical Resistance, see Resistance Comparators

COMPARATORS, Mechanical, see Dimensional Gages, Mechanical

COMPARATORS, Optical, see Dimensional Gages, Optical

COMPARATORS, Surface Finish, see Dimensional Gages, Surface Finish

COMPARATORS, Voltage, see Voltage Comparators

COMPASSES, Aircraft

Aeromarine Instr. Co.
Aircraft Radio
Airpath Instr. Co.
Arma Div.
Autoflight Inst. Div.
Bendix, Eclipse-Pioneer
Borg. Corp.
Electro-Mec. Lab.
Elgin Natl. Watch
Flight Research Eng.
GE, Apparatus Sales
Giannini & Co.
Hull Mfg.
Instr. Assocs.
Kearfott Co.
Koehler Instr. Co.
Kollsman Instr. Corp.
Marine Compass
Matisa Equipt. Corp.
Moisture Register Co.
Norden-Ketay
RCA Div.
Sperry Gyroscope
Star Compass Co.
Summers Gyroscope
Suverkrop Instruments
U. S. Gauge Div.

COMPASSES, Automobile

Arma Div.
Hull Mfg.
Star Compass Co.
Thermometer Corp.
U. S. Gauge Div.

COMPASSES, Azimuth

Abrams Instr. Co.
Ainsworth & Sons
Arma Div.
Bendix Aviation Corp.
Berger & Sons

Brunson Instr. Co.
Dusenbery Co.
G E, Apparatus Sales
G E, Instr. Dept.
Garlynn Engrg. Co.
Gurley, W. & L. E.
Hopp Press
Kearfott Co.
Keuffel & Esser
Kollsman Instr. Co.
Leupold & Stevens
Los Angeles Scientific
Negus, T. S. & J. D.
Norden-Ketay
Pioneer Instr. Co.
Ritchie & Son
Summers Gyroscope
Suverkrop Instruments
Taylor Instr. Cos.
Warren-Knight
Wild Heerbrugg

COMPASSES, Dip

Dusenbery Co.
Garlynn Engrg. Co.
Gurley, W. & L. E.
Keuffel & Esser
Marine Compass Co.
Los Angeles Scientific
Post Co.
Ruska Instr. Corp.
Sprengnether Instr.
Suverkrop Instruments
Taylor Instr. Cos.
Warren-Knight
Welsh Mfg. Co., W. M.

COMPASSES, Drafting Room, see Drawing Instruments

COMPASSES, Gyro

Aircraft Radio
Arma Div.
Bendix, Eclipse-Pioneer
Daystrom-Pacific
Flight Research Eng.
GE, Apparatus Sales
GE, Instr. Dept.
Instr. Associates
Kearfott Co.
Lear Inc.
Norden-Ketay
Pacific Scientific
Sperry Gyroscope
Summers Gyroscope
Vectron, Inc.

COMPASSES, Luminous Prismatic

Brunson Instr. Co.
Can. Rad. & Uran.
Dietzgen Co.
Kollsman Instr. Co.
Marine Compass Co.
Ritchie & Son
Scope Instr. Corp.
Surverkop Instruments
Taylor Instr. Cos.
White Co., Inc., David

COMPASSES, Magnetic

Aeromarine Instr. Co.
Ainsworth & Sons
Airpath Instrument
Baker Compass Co.
Bendix, Eclipse-Pioneer
Berger & Sons
Brunson Instr. Co.
Central Scientific
Collins Radio
Dietzgen Co.
Dusenbery Co.
Electro-Mec Lab.
Flight Research Co.
Garlynn Engrg. Co.
G E
Georator Corp.
Gurley, W. & L. E.
Hand & Sons
Hull Mfg.
Instr. Assocs.
Kearfott Co.
Keuffel & Esser
Kollsman Instr. Corp.
Leupold & Stevens
Marine Compass Co.
Marshall Co.
Negus T. S. & J. D.
Norden-Ketay
Northwest Instrument
Post Co.
Ritchie & Son
Ruska Instr. Co.
Standard Science Supply
Star Compass Co.
Summers Gyroscope
Suverkop Instruments
Smith & Anderson
Taylor Instr. Cos.
Testrite Instrument Co.
Thermometer Corp.
U. S. Gauge Div.
Warren-Knight
Welch Mfg. Co., W. M.
David White Co., Inc.

COMPASSES, Marine

Aeromarine Instr. Co.
Airpath Instr.
Arma Div.
Baker Compass Co.
Bendix Aviation Corp.
Bliss & Co.
Bunnell Co.
Daystrom Instrument
Dirigo Compass & Instr.
Dusenbery Co.
Georator Corp.
Hand & Sons
Hull Mfg.
Lear, Inc.
Marine Compass Co.
Negus T. S. & J. D.
Ritchie & Son
Scope Instr. Corp.
Smith & Anderson
Sperry Gyroscope
Starr Compass Co.
Welch Mfg. Co., W. M.

COMPASSES, Radio

Aircraft Radio Corp.
Bendix, Eclipse-Pioneer
Collins Radio
Fairchild (Syosset)
Fisher Research Lab.
Hickok Electcl. Instr.
Kaar Engrg. Co.
Kearfott Co., Inc.
Lear, Inc.
RCA Div.
Thordarson-Meissner
Transval Engrg. Corp.
Triumph Mfg. Co.

COMPASSES, Ship, see Compasses, Marine

COMPASSES, Telltale, see Compasses, Marine

COMPENSATION, Magnetic

Aeromarine Instr. Co.
Airpath Instrument
Dirigo Compass & Instr.
Dusenbery Co.
G E, Apparatus Sales
Georator Corp.
Hand & Sons
Marine Compass Co.
Moore Corp., John B.

COMPOSITION ANALYZERS, see Analytical Instruments

COMPOUNDS, Cleaning, see, Cleaning Compounds

COMPRESSION TESTING MACHINES, see Testing Machines

COMPRESSORS, Instrument-Air, see Air Compressors

COMPUTERS, Analog, Electronic

ACF Electronics
Advanced Electronics
Aero Electronics Co.
Air Assocs.
Aircraft Armament
AiResearch Mfg. Co.
Allegany Instr. Co.
Amer. Electronic Labs.
Amer. Mach. & Foundry
Analogue Controls, Inc.
Arma Div.
Atomic Instr. Co.
Audio Instr. Co.
Austin Co.
Avion Div.
Bendix Aviation Corp.
Berkeley Div.
C. G. S. Labs.
Cal-Tronics
Cedar Engrg. Co.
Computer Corp. of Amer.
Computer Engrg. Assocs.
Control Specialists, Inc.
Curtiss-Wright
Donner Scientific
Electronic Assocs., Inc.
Engineering & Res. Corp.
Epsco, Inc.
Farrand Optical
Fischer & Porter
Ford Instr. Co.
Franklin Electronics
Furst Electronics, Inc.
Goodyear Aircraft
Hanson-Gorrill-Brian
Hathaway Instr. Co.
Industrial Control Co.
Industrial Gauges Corp.
Instr. Components, Inc.
Jack Scient. Instr.
Kearfott Co.
Kollsman Instr. Corp.
L & O Res. & Devel. Co.
Librascope, Inc.
Link Aviation
Magnetic Amplifiers, Inc.
Mega Research, Inc.
Mid-Century Instrumatic
Miller Insts., William
Norden-Ketay
North Amer. Philips
Nuclear Devel. Corp.
Nuclear Corp. of Amer.
Oster Mfg. Co., John
Panellit, Inc.
Parsons Co., Ralph M.
Philbrick Researches
Photobell Co.
Raytheon Mfg.
Reeves Instr. Corp.
Reflectone Corp.
Remington Rand
Servo Corp. of America
Servomechanisms, Inc.
Southw. Indust. Electronic
Specialties, Inc.
Std. Elect. Time Co.
Sterling Prec. Instr. Corp.
System Analyzer Corp.
Taller & Cooper
Texas Insts., Inc.
Topp Industries
Transval Engrg. Corp.
Ultrasonic Corp.
Vectron, Inc.
Wang Labs.
Weber Aircraft Corp.
Weston Electcl Instr.
Westronics, Inc.

COMPUTERS, Digital, Electronic

ACF Electronics
Advanced Electronics
Aero Electronics
Air Assocs.
Aircraft Armaments
Alcor Electronics
Allengany Instr. Co.
Amer. Electronics Labs.
Analogue Controls, Inc.
Arma Corp.
Austin Co.
Avion Div.
Baird Assocs.-Atomic Instr.
Bendix, Computer Div.
Burroughs Electronics
C. G. S. Labs
Cal-Tronics
Clevite Res. Center
Computer Control Co.
ElectroData Corp.
Electronic Computer Div.
Electronic Control Systems
Electronics Corp. of Amer.
Engineering & Res. Corp.
Epsco, Inc.
Ferranti Electric
Ford Instr. Co.
Forro Scientific
GE, Apparatus Sales
Giannini & Co.
Goodyear Aircraft
Hogan Labs.
Indust. Electronic Engrs.
Internat. Business Machs.
International Telemeter
Jacobs Instr. Co.
Kearfott Co.
Lab. for Electronics
Librascope, Inc.
Librascope, Burbank Div.
Logistics Research
Loral Electronics
Marchant Calculators
Marchant Research
Minnesota Electronics
Monroe Calc. Mach. Co.
Mountain Systems, Inc.
Natl. Cash Register
Non-Linear Systems
Norden-Ketay
North American Philips
Nuclear Devel. Corp.
Nuclear Corp. of Amer.
Oster Mfg. Co., John
Photobell Co.
Potter Instr. Co.
Radio Corp. of Amer.
Raytheon Mfg.
Rea Co., J. B.
Reflectone Corp.
Remington Rand
Servo Corp. of Amer.
Sterling Precision
Systematics, Inc.
Taller & Cooper
Technitrol Engrg. Co.
Telemeter Magnetics, Inc.
Texas Insts., Inc.
Ultrasonic Corp.
Underwood Corp.
Walkirt Co.
Wang Labs., Inc.
Weber Aircraft Corp.
Westronics, Inc.

COMPUTERS, Mechanical and Electro-Mechanical, including Desk Computing Machines

Acton Labs.
Aero Electronics
Ahrendt Instr. Co.
Aircraft Armaments
Alden Systems Co.
Analogue Controls, Inc.
Arma Div.
Computer Control Co.
Electronics Corp. of Amer.
Engrg. & Res. Corp.
Giannini & Co.
Greenleaf Mfg.
Hagan Corp.
Industrial Control Co.
Internat. Business Machs.
L & O Res. & Devel.
Librascope, Inc.
Marchant Calculators
Monroe Calc. Machs.
Norden-Ketay
North Electric
Nuclear Devel. Corp.
PIC Design Corp.
Reeves Instr. Corp.
Reflectone Corp.
Servomechanisms, Inc.
Systematics Inc.
Underwood Corp.
Weber Aircraft Corp.

CONCENTRATION RECORDERS, see Analytical Instruments, pH, etc.

CONCRETE and CEMENT TEST APPARATUS

Amer. Instr. Co.
Ann Arbor Instr. Wks.
Autoclave Engrs.
Baldwin-Lima-Hamilton
Blue M Electric
Borden Engrg. Co.
Bowen & Co.
Burrell Corp.
Carver, Fred S.
Central Scientific
Custom Scientific Insts.
Dillon & Co., W. C.
Electro Prod. Labs.
Emery Co.
Exact Weight Scale
Fisher Scientific
Hacker & Co.
Hayes Scientific App.
Humboldt Mfg. Co.
Kinetic Instr. Co.
Olsen Testing Machine
Opplem Co.
Precision Scientific
Refinery Supply Co.
Riehle Div.
Scientific Instr. Co.
Scott Testers
Sodemann Heat & Power Co.
Steel City Testing Machs.
Soiltest, Inc.
Taber Instr. Co.
Testing Machines, Inc.
U.S. Testing Co.
Western Machy. Co.

CONDENSATION CONTROLLERS, see Boiler Room Instruments

CONDENSER TESTERS, see Boiler Room Instruments, also Capacitance Indicators (Electrical)

CONDENSER TUBES, Ceramic

Amer. Lava Corp.
Centralab Div.
Eitel-McCullough
General Ceramic
Harshaw Chemical
Internat. Products Corp.
Saxonburg Ceramics
Steatite Div.
Steward Mfg.
Stupakoff Div.

CONDENSERS, Electric, see Capacitors

CONDUCTIVITY CELLS, Electrical

Allied Controls Co.
Amer. Instr. Co.
Cambridge Instr. Co.
Central Scientific
Coleman Electric
Continental Electric
Engelhard Co., Chas.
Fisher Scientific
Foxboro Co.
Fredericks Co., George
Gray Instr. Co.
Greiner Glassblowing Lab.
H-B Instr. Co.
Industrial Insts., Inc.
Instrument Lab., Inc.
Kahn & Co.
Klett Mfg.
Leeds & Northrup
Minnesota Electronics
Nester Co.
Penfield Mfg. Co.
Phoenix Prec. Instr.
Revere Corp.
Sargent & Co.
Scientific Glass App.
Servall Inc., Ivan
Victory Engrg. Co.

CONDUCTIVITY CELLS, Thermal

Federal Telephone & Radio
Leeds & Northrup
Victory Engrg. Corp.

CONDUCTIVITY METERS

ACF Electronics
Amer. Instr. Co.
Associated Research Inc.
B & K Mfg.
Bailey Meter Co.
Biddle Co., James G.
Boonton Radio
Bristol Co.
Central Scientific
Coleman Instr. Co.
Davis Emergency Equipt.
Diatron Co.
Dice Co.
Doelcam Div.
Electronic Prods. Co.
Esterline-Angus
Fielden Instr. Div.
Foxboro Co.
GE, Apparatus Sales
General Electronic
Gray Instr. Co.
Industrial Insts., Inc.
Instrument Lab. Inc.
Kahn & Co.
Leeds & Northrup
Magnaflux Corp.
Minneapolis-Honeywell
Minnesota Electronics
Penfield Mfg.
Phaostron Co.
RCA Div.
Revere Corp.
Rubicon Co.
Sensitive Res. Instr.
Shallcross Mfg.
Sherron Metallic Corp.
Sticht Co., Herman H.
Thwing-Albert

CONDUIT, Flexible

Amer. Brass
Amer. Phenolic Corp.
Breeze Corporations
Chicago Metal Hose
Conduflex Corp.
Flexonics Corp.
GE
Illinois Coil Spring
Polymer Corp.
Raybestos Manhattan
Stow Mfg.
U. S. Rubber
Univ. Metal Hose

CONES, Pyrometric, see Pyrometric Cones

CONES, Slump, see Pyrometric Cones

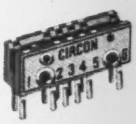
CONNECTORS, Electrical, Multi-Pole, including Coaxial Cable

Aerolite Electronics
Aircraft Marine Prods.
Aircraft Radio
AiResearch Mfg. Co.
Alden Products
American Brass Co.
Amphenol Electronics
Anton Electronics Labs.
Armel Electronics
Autom. Switch Co.
Bendix, Scintilla

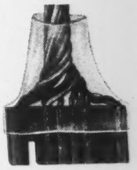
CIRCON

SPECIALIZED MINIATURE and SUB-MINIATURE ELECTRONIC-INSTRUMENT EQUIPMENT

PRINTED CIRCUIT CONNECTORS



FEMALE Compression loaded Contact Connectors give a wide range of flexibility of contact arrangement, cabling, and design application. They are open end design for all standard circuit thicknesses in one and two ampere models. 4, 12, 24, 36, 48 and 60 contacts—IN STOCK.



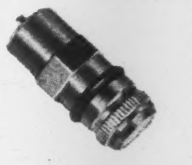
MALE Connectors in compatible sizes give two-way cabling to precision printed or instrument circuits with highest contact performance.

All connectors exceed temperature requirements MIL-E-5400, humidity MIL-P-15035, Type PRE-P, and conform to N.E.M.A. tolerances.

MINIATURE PRECISION HARDWARE

Finest premium quality instrument and electronic hardware. Instrument screws, nuts, split lock and flat washers. Gold plated, shot burnished instrument rivets and eyelets. Forty-five sizes start at 1/16" x 3/64" and up in 1/32" increments. IN STOCK. MICROMINIATURE Terminal Lugs and 1/32" diameter Rivets for extremely compact printed circuits and other electronic and instrument applications.

NEW MINIATURE INDICATOR LAMP ASSEMBLIES



For printed or regular circuits. 3/8" x 5/16" front, 1/2" rear projection. Mount 7/16" centers. Over 1000 on 12" panel. Available in 1.3, 2.7, 6, 14, 28 volts in stock. Standard and special message indications and colors. Vibration proof mounting without fasteners and easily replaced standard incandescent bulbs are prime service features of the unit. Finest quality materials and sealed construction for military end use and finest commercial applications.

Representatives in United States and Canada

CIRCON
Component Company
Santa Barbara Municipal Airport
Goleta, California
Telephone WOodland 8 2011

For more information circle 99 on inquiry card.

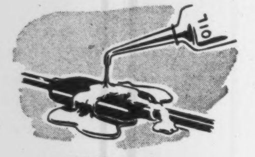
Partners in Production

Joy Electrical Connectors
and
Automatic Controls

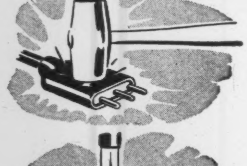
What happens to Automation . . . when electrical connectors fail?

No automatic control system yet devised will keep machines running when an electrical plug or receptacle in their power feeder line or power control circuit *poops out.* That's why JOY's one-piece molded Neoprene connectors deserve your careful consideration. Factory wired and permanently molded to cord or cable, they provide many extra advantages that add up to a long life of dependable service under the most adverse operating conditions. (A few are listed below.) Available in a wide variety of designs with 1 through 16 contacts for 150 to 600 volt applications. **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Co. (Canada) Limited, Galt, Ontario.*

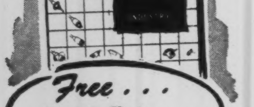
Oil-Sealed . . .
One-piece molded cable connector assembly protects conductors from oil and other external impurities. Face rings protect contacts from similar contamination, when connectors are engaged.



Distortion-Proof . . .
Factory molded as trim one-piece synthetic rubber jacketed units, JOY connectors cannot crack, will not shatter and are practically impossible to knock out of shape.



Moisture-Tight
JOY electrical connectors are absolutely moisture-tight from wiring juncture to face . . . and when connected even their contacts are protectively encased in a resilient housing.



Free . . .
New Bulletin —
Ask for No. B59

CD 355.2

JOY
SOURCE OF INDUSTRY'S FAVORITE ELECTRICAL CONNECTORS SINCE '28

For more information circle **100** on inquiry card.

Breeze Corporations
Brit. Electronic Sales
Buchanan Electcl. Prods.
Cannon Electric
Cinch Mfg. Co.
Circon Components Co.
Coaxial Connector Co.
Continental Connector
Dage Electric
Danbury-Knudsen
DeJur-Amsco
Diamond Instr. Co.
Diamond Mfg. Corp.
Dole Valve Co.
Eastern Specialty Co.
Eby, Inc., Hugh H.
Farnsworth Electronics
Felt Corp.
GE
General Radio
Gordon Co., Claude S.
Harwood Corp.
Hermetic Sealed Prods.
Instrument Parts Corp.
Jerrold Electronics
Johnson Co., E. F.
Joy Mfg. Co.
Kellogg Switchboard
Kulka Electric Mfg.
Lab-Tronics
Lapp Insulator Co.
Mallory & Co., P. R.
Microdot, Inc.
Molded Insulation Co.
Nems-Clarke, Inc.
North Electric Mfg. Co.
Northam-Warren
Parker-Appliance Co.
Patton-MacGuyer Co.
Phaostron Co.
Precision Mfg. Co.
Precision Parts Co.
Pyle National Co.
Reliable Electric Co.
Rodale Mfg. Co.
Seals, Inc.
Shielding, Inc.
States Co.
Steel Co., Herman D.
Stimpson Co., Edwin B.
Superior Elect. Co.
Swissomatic Products
Switchcraft, Inc.
Sylvania Elect. Prods.
Technical Soldering Co.
Thwing-Albert
Ucinite Co.
U. S. Components
U. S. Gasket Co.
Vector Electronic Co.
Viking Electric
Viking Industries, Inc.
Waltham Horological Corp.
Waterbury Cos.
Watertown Mfg. Co.
Whitney Blake Co.
Wiggins Oil Tool
Winchester Electronics
Wirt Co.

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For more information circle **101** on inquiry card.

CONNECTORS, Plugs, Clips, Posts, Jacks

Aero Electric
Aerolite Electronics
Aerovox Corp.
Aircraft Marine Products
Aircraft Radio
AiResearch Mfg.
Air-O-Tronics
Alden Products
Alden Systems Co.
Amer. Elite, Inc.
Amer. Instr. Co.
Amer. Lava Corp.
Amphenol Electronics
Anton Electronics Labs.
Audio Devel. Co.
Autocall Co.
Automatic Electric
Autom. & Prec. Mfg. Co.
Baird Assocs.-Atomic Instr.
Bendix, Scintilla
Berkshire Labs.
Breeze Corporations
Brit. Electronic Sales
Bud Radio
Buggie & Co.
Burke Electric
Burndy Engrg. Co.
Cambridge Thermionic
Cannon Electric
Carter Parts Co.
Cinch Mfg. Co.
Cinema Engrg. Co.
Circon Component Co.
Clare & Co.
Coaxial Connector Co.
Conax Corp.
Consolidated Mld. Prods.
Continental Connector
Crow Electri-Craft Corp.
Dage Electric
DeJur-Amsco
DeMornay-Bonardi
Dialight Corp.
Diamond Mfg. Co.
Dittmore & Freimuth
Eastern Specialty Co.
Eby, Inc., Hugh H.
Electronics Prods. Co.
Electrosig Corp.
Federal Screw Prods.
Federal Telephone & Radio
Felts Corp.
Garde Mfg. Co.
GE
General Radio
Graphik Circuits Div.
Grayhill, Inc.
Hartford Mach. Screw
Harvey-Wells Electronics
Indust. Hardw. Mfg.
Instrument Parts Corp.
Insuline Corp. of Amer.
Internat. Std. Trading
Johnson Co., E. F.
Jones, Howard B., Div.
Joy Mfg.
Kellogg Switchboard
Kulka Electric
Lab-Tronics
Land-Air, Inc.
Lectronic Research Labs.
Lerco Electronics
Lessells & Assocs.
Lewis Engrg. Co.
Lynn Electronic Res.
Mallory & Co., P. R.
Martindale Electric
Meter Devices Co.
Microdot, Inc.
Millen Mfg. Co.
Molded Insulation Co.
Mueller Electric
National Tel-Tronics
North Electric
Nems-Clarke
Peck Spring Co.
Phaostron Co.
Precision Mfg. Co.
Precision Parts Co.
Pyle-National
RCA
Raytheon Mfg. Co.
Revere Corp.
Richards Co., Inc.
Rodale Mfg. Co.
Scovill Mfg. Co.
Seals, Inc.
Snellcross Mfg.
Signal Indicator Corp.
Smith, Inc., Herman H.
Stafford Co.
Std Elect. Time Co.
States Co.
Steel Co., Herman D.
Stronghold Screw Prods.
Superior Electric
Swissomatic Products
Switchcraft, Inc.
Sylvania Elect. Prods.
Telex, Inc.
Thermo-Electric Co.
Thwing-Albert
Torrington Co.
Ucinite Co.
U. S. Components
U. S. Engrg. Co.
U. S. Gasket Co.
U. S. Instr. Corp.
Vallorbs Jewel Co.
Vector Electronic Co.
Victor Electronic
Viking Industries
Virginia Electronics
Waltham Horological Corp.
Waltham Screw Co.
Whitney Blake Co.
Wiggins Oil Tool Co.
Winchester Electronics
Winslow Co., Inc.

CONNECTORS, Printed Circuit

Aerolite Electronics
Aerovox Corp.
Aircraft-Marine Prods.
Alden Products
Amphenol Electronics
Anton Electronics Labs.
Armel Electronics
Brit. Electronic Sales
Cannon Electric
Centralab Div.
Cinch Mfg. Co.
Circon Component Co.
Coaxial Connector Co.
Continental Connector
Continental-Diamond Fibre
Corning Glass Works
DeJur-Amsco
Garde Mfg. Co.
Graphik Circuits Div.
Lab-Tronics
Lerco Electronics
Microdot, Inc.
National Tel-Tronics
Sylvania Elect. Prods.
Viking Industries, Inc.
Whitney Blake Co.
Winchester Electronics

CONSISTENCY REGULATORS, Pulp and Paper

Askania Reg. Co.
Bailey Meter Co.
Brabender Corp.
Bristol Co.
DeZurik Shower Co.
Dressen-Barnes
Electric Eye Equipt. Co.
Fischer & Porter Co.
Foxboro Co.
General Controls
General Regulator
Hammel-Dahl
Industrial Control Panel
Lumenite Electronic
Mason-Neilan Div.
Merritt Engrg. & Sales
McAlear Mfg.
Northern Equipt. Co.
Ohmart Corp.
Photobell Co.
R. K. L. Valves & Mfg.
Shallcross Controls
Taylor Instr. Cos.

CONSTANT SPEED AND FREQUENCY Sets, see Speed or Frequency

CONTACT METERS, see D'Arsonval-type Controllers

CONTACTORS, see Relays

CONTACTS, Electrical, including Carbon, Metal, Graphite, Powdered Metal, and Tungsten

Acheson Colloids
Adams & Westlake
Aircraft-Marine Prods.
Airflyte Electronics
Alden Products
Amer. Electro-Metal
Amer. Silver Co.

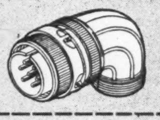
connect with CANNON PLUGS

for better electrical and electronic equipment

USE

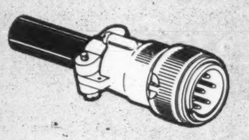
TYPICAL DESIGNS

for AIRCRAFT and ELECTRONIC INSTRUMENTS



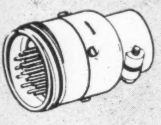
AN, AN-A, AN-B, AN-C...Conforming to Specification MIL-C-5015C. 15 insert diameters and 260 contact layouts. 6 shell styles, AN3100 to AN3108 with all accessories. Also (AN) F, O(*)AF.

for VIBRATION RESISTANCE and MOISTURE-PROOF applications



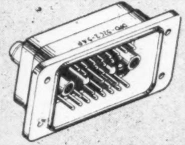
AN-E SERIES ... environment resisting. Replaces AN-M. Meets Specification MIL-C-5015C. Resilient inserts. Integral cable clamp. New grounding lugs. Interfacial sealing, improved grommet and new grommet follower.

for GENERAL CIRCUITRY and° QUICK DISCONNECT in more rugged applications



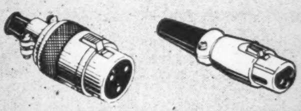
K, RK SERIES...SPECIAL ACME THREAD. The All-Purpose Series. Conduit and cable clamp entry types. 1 to 82 contacts in 213 different contact layouts. 10-, 15-, 30-, 40-, 60-, 80-, 115-, and 200-amp. silver-plated contacts. High quality phenolic, melamine, and formica insulators. Cadmium-plated aluminum alloy shells.

for UNIT-PLUG-IN applications . . .



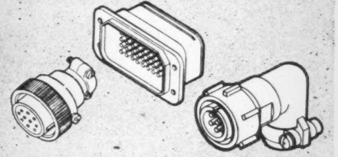
DP, DPB, DPD, DPD2, DPD2R, DPR, AND DPM SERIES... Rack/panel/chassis. With and without shells; coaxial and high voltage contacts. Permit quick disconnect, interchange, replacement, testing and inspection of assemblies and sub-assemblies.

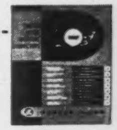
for AUDIO and LOW LEVEL circuits



P, XLR, XL, XK, O, UA, BRS SERIES... many shell styles and insert layouts. Straight and angle 90° plugs. Latch-lock types. Wall-mounting, panel, lock-nut mounting, and adapter receptacles, single- and two-gang. 10- to 30-amp. contacts, coaxials. UA Series features 3 gold-plated contacts.

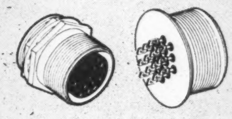
for RADIO and SUB-MINIATURE applications





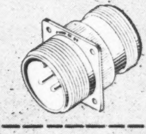
D, MC, DPA, DPX, AND K MINIATURES... miniatures and sub-miniatures designed for amplifiers, miniature indicators, computer circuits, telemetering equipment, small pre-amps, and general instrumentation where space is limited and current requirements are generally not over 5 amperes. Variety of shell styles, junction shell, and insert arrangements. 3 to 50 contacts, plus coaxials.

for HERMETICALLY SEALED applications



GS (AN TYPE), KH, RKH, DAH, BFH, TBFH, DBH, KH30... with steel shells and contacts to withstand high pressures from within or without. Insulation is a glass material, fused under high temperature to shell and contacts, thus forming a hermetic seal.

for HIGH TEMPERATURE and firewall applications



AN-K, AN-"FW," AND CANNON K-"FW" STEEL SHELL CONNECTORS... Open flame protection offered in the greatest variety of this type of connector. Wall- or box-mounting receptacles. Straight or angle 90° plugs. Crimp-type contacts. Inserts of glass-filled materials.

Send for AR Condensed Catalog containing illustrations and technical information on all principal series of connectors in the extensive Cannon Line.

CANNON ELECTRIC COMPANY, 3208 Humboldt St., Los Angeles 31, California. Factories in Los Angeles, East Haven, Conn., Wakefield, Mass., Toronto, Can., London, Eng., Melbourne, Austl. Manufacturing licensees Paris, Tokyo. Representatives and distributors in all principal cities.

please refer to Dept. 419

CANNON ELECTRIC

Since 1915

For more information circle **102** on inquiry card.

PANALOG

PANELLIT PSC SERVICE CORP.

PANELLIT, INC

7405 N. Hamlin Ave., Skokie, Ill.
COrnelia 7-8300

211 Odd Fellows Bldg.
10th & King Sts.
Wilmington, Del.

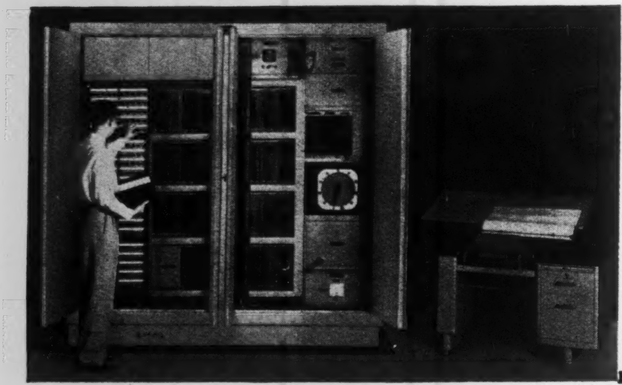
3025 W. Mission Road
Alhambra, Calif.

Panellit of Canada, Ltd.
Toronto 14

ENGINEERED INFORMATION SYSTEMS FOR INDUSTRY

PANELLIT

PANALARM



PANALOG INFORMATION SYSTEMS

Panalog Information Systems provide complete, centralized process control to management. The system is designed to feed data to electric typewriters . . . directly, without human translation, to calculators for automatic accounting operations . . . or to computers for on-the-spot engineering analysis.

The Panalog Information System incorporates continuous process monitoring with audio-visual annunciation, periodic or "on-demand" logging of up to several thousand variables, immediate logging of both "off-normal" and "return-to-normal" occurrences, selectional trend recording and complete process control.

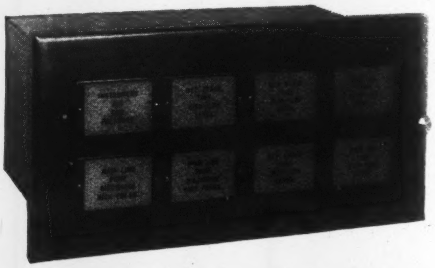
Logging is arranged by processing unit, rather than type of variable, so that a clear picture is presented for operating decisions.

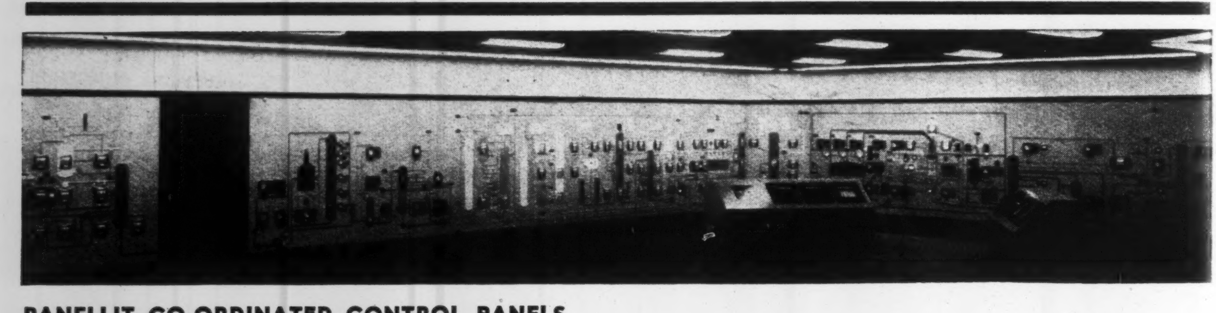
Panellit furnishes a complete service, from basic system design and engineering to final installation, check-out and service. **Send for literature.**

PANALARM PROCESS ANNUNCIATOR SYSTEMS

Panalarm Annunciator Systems, the recognized standard in the process field, are available in numerous forms to fulfill all specific requirements.

Panalarm Annunciator Systems provide both a visual and audible signal when an "off-normal" condition develops. Panalarm "50" models provide the most versatile form of annunciation available today. Fulfill the requirements of every usual process application. **Send for literature.**



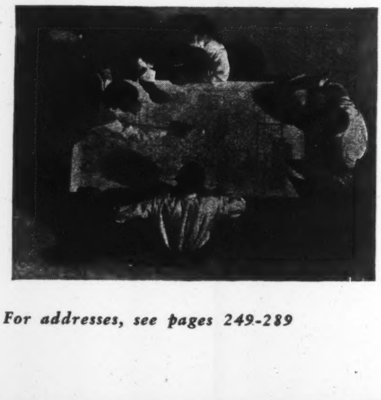


PANELLIT CO-ORDINATED CONTROL PANELS

Panellit is the largest builder of process control panels. Specialized experience in this field enables Panellit to provide valuable engineering assistance. Panellit behind-the-panel engineering, incoporating clear, traceable piping and individual equipment enclosures assures maximum serviceability of your control system. **Send for literature.**

PANELLIT SERVICE CORPORATION—"PSC"

Panellit Service Corporation provides a single responsible service for instrumentation systems—survey, engineering, construction (startup and commissioning), and maintenance. "PSC" is staffed with a corps of highly skilled, experienced instrument specialists. **Send for literature.**



For more information circle **103** on inquiry card.

Baker & Co.
Brainin Co.
Cannon Electric
Cinch Mfg. Co.
Cleveland Tungsten, Inc.
Coaxial Connector Co.
Diamond Instr. Co.
Eby, Inc., Hugh H.
Fansteel Metallurgical
GE
General Plate Div.
General Tungsten Mfg.
Gibson Electric
Graphite Metallizing
Grammes & Sons, Inc.
Guardian Electric Mfg.
Hermetic Sealed Prods.
Howard Clock
Instr. Parts Corp.
Instrument Specialties
Johnson Co., E. F.
Keystone Carbon Co.
Mallory & Co., P. R.
Morganite, Inc.
National Carbon Co.
New Haven Clock
Ney Co.
Ohio Carbon Co.
Peck Spring Co.
Permo Prod. Corp.
Precision Mfg. Co.
Reisner Mfg.
Scovill Mfg.
Sittler Corp.
Stackpole Carbon Co.
Stimpson Co.
Speer Carbon Co.
Sphinx American Co.
Stackpole Carbon Co.
Steel Co., Herman D.
Swiss Amer. Jewel Bear.
Sylvania Elect. Prods.
Tinnerman Products
Trerice Co.
Tungsten Contact Mfg.
Ucinite Co.
Vallorbs Jewel Co.
Viking Industries
Waterbury Cos.
Westinghouse Electric
Willey's Carbide Tool Co.
Wilson Co., H. A.

CONTACTS, Precious Metal, including Platinum and Silver

Airflyte Electronics Co.
Amer. Kloeckner-Moeller
Amer. Platinum Works
Amer. Silver Co.
Automatic Electric
Baker & Co.
Bishop & Co., J.
Brainin Co.
Cohn Corp., Sigmund
Fansteel Metallurgical
General Control Co.
General Plate Div.
Gibson Electric
Grammes & Sons
Graphite Metallizing
Guardian Electric
Instrument Corp. of Amer.
Instrument Parts Corp.
Keystone Carbon Co.
Mallory & Co., P. R.
Microcircuits Co.
Ney Co., J. M.
Ohio Carbon Co.
Permo Prods. Corp.
Precision Mfg. Co.
Preco Co.
Research Devel. Mfg.
Sherman & Co.
Slip Ring Co. of Amer.
Speer Carbon Co.
Stackpole Carbon Co.
Swissomatic Products
Sylvania Elect. Prods.
Wilson Co., H. A.

CONTOUR MEASURING PROJECTORS, see Dimensional Gages, Optical

CONTROL BOARDS and HOUSINGS, see Panels

CONTROL DRIVES, see Cylinders; also Motors, Servo; also Valve Operating Devices

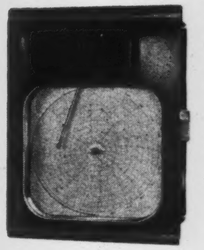
CONTROL SYSTEMS, General-purpose, Air-operated, for Process

CONTROLS, (see also the Object of Control)

Accessory Products Corp.
Amer. Kloeckner-Moeller
Amer. Meter Co.
Atchley, Inc., Raymond
Autom. Contr. Co.
Automation Corp. of Amer.
Autom. Temp. Contr. Co.
B-I-F Industries
Bailey Meter Co.
Black, Sivalls, & Bryson
Bristol Co.
Brit. Electronic Sales
Brookfield Engrg. Labs.
Brooks Rotameter
Cash Co., A. W.
Cash Valve Mfg. Corp.
Century Controls Corp.
Cooper Co., Clark
Conoflow Corp.
Dahl Co., Inc., G. W.
El Mec Labs.
Emmett Mach. & Mfg.
Engrg. & Res. Corp.
Fischer & Porter Co.
Fisher Governor
Foxboro Co.
Fulton-Sylphon Div.
General Control Co.
General Controls Co.
Genl. Reg. Corp.
Giannini & Co.
Hagan Corp.
Infilco
Johnson Service Co.
Jordan Reg. Corp.
Keckley Co., O. C.
Lake Erie Electric
Leeds & Northrup
Leslie Co.
Link Engrg. Co.
Manning, Maxwell & Moore
Moore Products
Mason-Neilan Div.
Mead Specialties Co.
Minneapolis-Honeywell
Natural Gas Equipt.
Penn Insts. Div.
Phila. Gear Works
Powers Reg. Co.
Radio Receptor Co.
Robertshaw-Fulton
Ram Meter, Inc.
Republic Flow Meters
Research Controls
Ross Operating Valve
Scaico Controls
Scientific Instr. Co.
Security Controls, Inc.
Shallcross Controls
Stratos Div.
Swanson Engrg. Co.
Taylor Instr. Cos.
Texas Apparatus Co.
Trecice Co.
Wallace & Tiernan
Weighing Components
Westinghouse Air Brake Co.

CONTROL SYSTEMS, General-purpose, Electrical or Electronic, for Process Control (see also the Object of Control)

Advanced Electronics, Inc.
Alabama Automation Corp.
Allen Bradley Co.
Amer. Kloeckner Moeller
Amer. Meter Co.
Amer. Electronic Labs.
Analogue Controls, Inc.
Arma Div.
Arnoux Corp.
Assembly Products
Austin Co.
Autom. Temp. Contr. Co.
Automatic Control
Autron Engrg., Inc.
Automation Corp. of Amer.
Automation Prods., Inc.
Avion Div.
B-I-F Industries
B & H Instrument
B/W Controller
Baldwin-Lima-Hamilton
Bailey Meter Co.
Barber-Colman
Bendix, Computer Div.
Bendix-Pacific
Berkeley Div.
Black, Sivalls, & Bryson
Bogue Electric Mfg.
Bristol Co.
Brooke Engrg. Co.
Brookfield Engrg. Labs.
Brooks Rotameter
Calif. Magnetic Cont. Corp.
Cedar Engrg., Inc.
Cincinnati Time Rec. Co.
Clark Controller Co.
Cooper Co., Clark
Commercial Controls Corp.
Computer Control Co.
Consol Electrodynamics
Crescent Engrg. & Res. Co.
Cutler-Hammer
Davenport Mfg. Co.
Deltron, Inc.
Diamond Power Spec. Corp.
Dietz Co., Henry G.
DuMont Labs., Allen B.
Elect. Eye Equipt. Co.
Electro Devices, Inc.
Electro Insts., Inc.
Electronic Associates, Inc.
Electronic Spec. Co.
Electronic Tube Corp.
Electronics Corp. of Amer.
El Mec Labs.
Engrg. & Res. Corp.
Erdco Engrg. Co.
Ess Instr. Co.
Farnsworth Electronics
Farrand Optical
Ferranti Electric
Ferrara, Inc.
Fischer & Porter Co.
Foxboro Co.
Franklin Electronics
Furnas Electric
GE, Apparatus Sales
General Control Co.
General Controls Co.
Genl. Regulator Corp.
Giannini & Co.
Hagan Corp.
Hammarlund Mfg.
Hays Corp.
Henschel Corp.
Indust. Gauges Co.
Indust. Electronics Engrs.
Indust. Nucleonics Corp.
Industrial Control Co.
Industrial Electronics
Infilco
Insco Company
Instrument Devel. Labs.
Instruments Inc.
Internat. Business Machs.
Jacobs Instr. Co.
Jarco Services, Inc.
Jay Mfg.
Keckly Co., O. C.
Lake Erie Electric
Larson Instr. Co.
Leeds & Northrup
Leslie Co.
Lessells & Assocs.
Librascope, Inc.
Link Engrg. Co.
Magnetic Instr. Co.
Magnetic Res. Corp.
Manning, Maxwell & Moore
Martin Sweets Co.
Maxson Instruments



Automatic Controllers

Bristol Controllers are made in a wide variety of models including air-operated, electronic, and electric types.

Five kinds of control action: on-off, proportional, reset, derivative, and reset plus derivative, also autoset and cascade controllers, ratio controllers, pneumatic transmission, miniature instruments, program controllers, electronic potentiometers. For temperatures up to 4000F, pressure, absolute pressure, vacuum, draft, liquid level, flow, pH, humidity, time cycle and program, and control panels.

Write for Bulletins A120, 036, A115, B226, and C305.

Series 500 Controller

BRISTOL COMPANY

112 Bristol Rd., Waterbury 20, Conn.

For more information circle **104** on inquiry card.

Mercoid Corp.
Mid-Century Instrumatics
Minneapolis-Honeywell
Mullenbach Div.
Nankervis Co.
Newton Co.
Norden-Ketay
Nuclear Research Corp.
Nuclear Devel. Corp.
Nuclear Corp. of Amer.
Oil Well Water Loc. Co.
Partlow Corp.
Penn Insts. Div.
Peschel Electronics
Phila. Gear Works
Phoenix Prec. Instr.
Photobell Co.
Photographic Products, Inc.
Post Machy. Co.
Potter Instr. Co.
Radio Receptor Co.
Ram Meter, Inc.
Ramo Wooldridge
Rea Co., J. B.
Reeves Instr. Corp.
Reflectone Corp.
Reliance Instr. Mfg. Corp.
Republic Flow Meters
Robotron Corp.
Rockwell Engrg. Co.
Robertshaw-Fulton
Sciaco Controls
Servo Corp. of Amer.
Servomechanisms, Inc.
Shallcross Controls
Simplex Valve & Meter
Southw. Ind. Electronics
Sparton Cont. Systems
Std. Electronic Res.
Stewart Instr. Co.
Suffolk Prods. Co.
Swanson Engrg. Co.
Swartwout Co.
Taylor Electric
Taylor Instr. Cos.
Technical App. Builders
Texas App. Co.
Thermo Electric Co.
Transmag Div.
Transval Engrg. Co.
Tri-Tronics Co.
United Engineers
Vickers Elect. Div.
Viking Insts., Inc.
Virginia Electronics
Vocaline Co. of Amer.
Vectrol Engrg., Inc.
WacLine, Inc.
Wang Labs.
Wolfe & Mann
Warner Elect. Brake
Warrick Co., Charles F.
Wiancko Engrg. Co.
Wolfe & Mann
Worner Electronic Devices
Zenith Electric

CONTROL SYSTEMS, General-purpose, Electromechanical, for Process Control (see also the Object of Control)

Abrams Instr. Corp.
Aeromarine Instr. Co.
Ahrendt Instr. Co.
Alabama Automation Corp.
Amer. Electronic Labs.
Amer. Kloeckner-Moeller
Amer. Meter Co.
Analogue Controls, Inc.
Arma Div.
Assembly Products
Austin Co.
Auto Control Labs.
Autom. Control Co.
Autom. Temp. Contr. Co.
Automation Corp. of Amer.
Automation Prods., Inc.
Autron Engrg., Inc.
Avion Div.
B-I-F Industries
Barber-Colman
Bendix, Pacific
Bowman Instr. Corp.
Brooke Engrg. Co.
Bristol Co.
Bush Assocs.
Cedar Engrg., Inc.
Clark Controller Co.
Cooper Co., Clark
Colvin Labs., Inc.
Computer Control Co.
Commercial Control Corp.
Cincinnati Time Rec. Co.
Consol. Electrodynamics
Counter & Controls Corp.
Cutler-Hammer
Curtiss-Wright
DuMont Labs., Allen B.
El Mec Labs.
Engrg. & Res. Corp.
Electro Devices, Inc.
Electronic Spec. Co.
Erdco Engrg. Co.
Farnsworth Electronics
Ferranti Electric
Foxboro Co.
Fulton-Sylphon
General Control Co.
General Controls Co.
Genl. Regulator Corp.
Giannini & Co.
Giannini, Datex Div.
Hagan Corp.
Helipot Div.
High Vacuum Equipt. Corp.
Ideal-Aerosmith
Indust. Control Panel Co.
Indust. Gauges Corp.
Industrial Control Co.
Industrial Electronics
Indikon Co.
Indust. Nucleonics Corp.
Infilco
Insco Company
Instrument Devel. Labs.
Jarco Services, Inc.
Lake Erie Electric
Larson Instr. Co.
Leeds & Northrup
Librascope, Inc.
Link Engrg. Co.
Martin Sweets Co.
Maxson Instr. Div.
Mid-Century Instrumatic
Magnetic Res. Corp.
Microlac Corp.
Minneapolis-Honeywell
Nankervis Co.
Newton Co.
Norden-Ketay
North Electric
Nuclear Corp. of Amer.
Partlow Corp.
Penn Insts. Co.
Phila. Gear Works
Photobell Co.
Photographic Products, Inc.
Radio Receptor Co
Ramapo Instr. Co.
Rea Co., J. B.
Reeves Instr. Corp.
Reliance Instr. Mfg.
Reynolds Electric
Robertshaw-Fulton
Sciaco Controls
Scientific Instr. Co.
Servo Corp. of Amer.
Servomechanisms, Inc.
Shallcross Controls
Simmonds Aerocessories
Simplex Valve & Meter
Suffolk Prods. Co.
Swanson Engrg. Co.
Taylor Electric
Taylor Instr. Cos.
Texas App. Co.
Transval Engrg. Corp.
United Engineers
Vapor Recovery Systems
Vectron, Inc.
Viking Instruments
WacLine Inc.
Wallace & Tiernan
Warner Elect. Brake
Weber Aircraft Corp.
Weighing Components, Inc.
Wolfe & Mann
Zenith Electric

CONTROL SYSTEMS, Machine Tool, see Machine Tool Controllers

CONTROL VALVES, see Valves

CONTROLLERS, see Object of Measurement and Control. For example, for Flow Controller, see Flow.

CONTROLLERS, Air, see Pressure Regulators, Air

CONTROLLERS, Beater, see Consistency Regulators

CONTROLLERS, Bin, see Level

CONTROLLERS, Condensation, see Boiler Room Instruments

CONTROLLERS, Condenser Leakage, see Boiler Room Instruments

CONTROLLERS, Damper, see Boiler Room Instruments

CONTROLLERS, Desuperheat, see Boiler Room Instruments

CONTROLLERS, Draft, see Boiler Room Instruments

CONTROLLERS, Feed Water, see Boiler Room Instruments

CONTROLLERS, Filter Rate, see Water Works Instruments

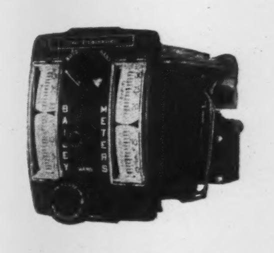
CONTROLLERS, Furnace, see Combustion Control, also Furnace Control

CONTROLLERS, Gas Density, see Density

CONTROLLERS, Light, see Illumination

CONTROLLERS, Manual, Field

Allis-Chalmers
Automatic Electric
Betts & Betts
Black, Sivalls & Bryson
Bristol Co.
Clark Controller Co.
Climax Div.
Cutler-Hammer
Dahl & Co., G. W.
Dormitzer Electric
Fischer & Porter Co.
General Controls
G E, Apparatus Sales



BAILEY

MINI-LINE

SELECTOR STATION

- Provides all necessary indications and controls for "bumpless" transfer and for complete automatic or hand operation of a pneumatic control system. Used as a combustion trend indicator, hand-auto selector, and set point or biasing adjuster.

May include as many as four indications of vital control system signals. Vibration and shock proof construction makes the Bailey MINI-LINE Selector Station suitable for marine, mobile, and other severe operating service.

Request Product Specification P99-1.

BAILEY METER COMPANY
1041 IVANHOE ROAD CLEVELAND, O
Bailey Meter Company, Ltd. Montreal, Canada

For more information circle **105** on inquiry card.

BAILEY

MINI-LINE

MANUAL LOADER

- Provides an operator with manual control of remote pneumatic power units. Includes single or duplex indications on a single scale. Uses sensitive, high-capacity, hand-operated air relay.

Standard loaders available for the following operations: Set Point (indicates loading and monitor); Bias (indicates loading and biased loading); and Basic (indicates loading only).

Vibration and shock proof construction makes the Bailey **MINI-LINE** Manual Loader suitable for marine, mobile, and other severe operating service.

Request Product Specification P99-2.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For more information circle **106** on inquiry card.

TYPE M 1253
WALKIRT

NOW EMBEDDED IN TOUGH, EPOXY RESIN

WALKIRT COUNTERS! That's mica-filled, thermal-setting resin! Permits storage, operation at temperatures minus 60° centigrade. Illustrated is Type M 1253 . . . Low Speed Binary Counter. Provides scale of two . . . is one of Walkirt's many popular plug-in packaged lines. Frequency range to 25 KC — Rise time 1 µs. (higher speeds available) — Output 80 volts, peak to peak — Ambient Temperature — 60°C to + 80°C. Weight only 3 ounces.

Need specialized packaging of sub-miniature resin embedments? Investigate the low-cost Walkirt way! We also stock units for measuring time intervals, highly repetitive activities, and units for other functions—amplifying, pulse shaping, pulse delaying, gating, time sequential switching. Full catalog on request.

PLUG-IN CIRCUITRY . . . Minimized Packaging!

THE WALKIRT CO.

145 WEST HAZEL ST., INGLEWOOD 3, CALIF.

For more information circle **107** on inquiry card.

Kieley & Mueller
Magnetic Instr. Co.
Manning, Maxwell & Moore
National Elect. Controller
Ohmite Mfg. Co.
Square D Co.
Swartwout Co.
Superdraulic Corp.
Taylor Instr. Cos.
Ward Leonard
Westinghouse Electric

CONTROLLERS, Manual, Hydraulic Output

Askania Reg. Co.
Autoclave Engrs.
B-I-F Industries
Barksdale Valves
Blue M Electric
Bristol Co.
Brooks Rotameter
Cash Co., A. W.
Cooper Co., Clark
Dahl & Co., G. W.
Denison Engrg. Co.
General Controls
Genl. Regulator Corp.
Hagan Corp.
Hammel-Dahl
Hydraulic Controls
Infilco
Minneapolis-Honeywell
Phila. Gear Works
Republic Flow Meters
Rivette Lathe & Grinder
Roy Co., Milton
Schade Valve Mfg.
Seely Instr. Co.
Shallcross Controls
Simplex Valve & Meter
Superdraulic Corp.
Trimount Instr. Co.
Vickers Inc.
Waterman Engrg. Co.
Westinghouse Electric

CONTROLLERS, Manual, Electric Motor Operated

Allen-Bradley
Allis-Chalmers
Amer. Kloeckner-Moeller
Automatic Elect. Mfg.
B-I-F Industries
Betts & Betts
Bogue Electric Mfg.
Bristol Co.
Brooke Engrg. Co.
Cardwell Mfg. Corp.
Clark Controller Co.
Cutler-Hammer
E-T-A-Products
Electronic & Engrg. Serv.
Fisher Governor
Furnas Electric
General Controls Co.
GE, Apparatus Sales
Genl. Regulator Corp.
Hays Corp.
Heller Co.
Keckley Co., O. C.
Lapp Insulator
Leeds & Northrup
Mag Elect. Prods.
Magnetic Amplifiers, Inc.
Magnetic Instr. Co.
Maxson Instrument Div.
Minneapolis-Honeywell
National Elect. Contr. Co.
Ohmite Mfg. Co.
Opad Electric
Paragon Electric
Phila. Gear Works
Raytheon Mfg.
Reliance Instr. Mfg.
Revco, Inc.
Scientific Instr. Co.
Servospeed Div.
Shallcross Controls
Simplex Valve & Meter
Square D Co.
Superior Electric
Teleflex, Inc.
Topp Industries
Trerice Co.
Trimount Instr. Co.
Ward Leonard
Westinghouse Electric
Wilson & Co.
Zenith Electric

CONTROLLERS, Manual, Pneumatic Output, including Manual/Auto Transfer Stations

AiResearch Mfg.
B-I-F Industries
Bailey Meter Co.
Barksdale Valves
Black, Sivalls & Bryson
Bristol Co.
Climax Div.
Conoflow Corp.
Cutler-Hammer
Dahl Co., Inc., G. W.
Emmett Mach. & Mfg.
Fischer & Porter Co.
Fisher Governor
Foxboro Co.
General Controls Co.
Gen. Regulator Corp.
Hagan Corp.
Infilco
Johnson Service Co.
Leslie Co.
Manning, Maxwell & Moore
Mason-Neilan Div.
Minneapolis-Honeywell
Moore Products
Natl. Pneumatic Co.
Panellit, Inc.
Penn Insts. Div.
Phila. Gear Works
Powers Reg. Co.
Republic Flow Meters
Research Control Instr.
Ross Operating Valve Co.
Scientific Instr. Co.
Shand & Jurs
Simplex Valve & Meter
Stratos Div.
Swartwout Co.
Taylor Instr. Cos.
Westinghouse Air Brake
Westinghouse Electric

CONTROLLERS, Manual, Rheostatic

Accessory Prods.
Allen-Bradley
Beck Bros.
Bogue Electric Mfg.
Bristol Co.
Centralab Div.
Clark Controller Co.
Cutler-Hammer
Electronic & Engrg. Serv.
General Controls Co.
GE, Apparatus Sales
General Radio
General Reg. Corp.
Heller Co.
Mallory & Co., P. R.
National Elect. Controller
Ohmite Mfg.
Phila. Gear Works
Rubicon Co.
United Optical
Ward Leonard
Westinghouse Electric

CONTROLLERS, Moisture, see Humidity

CONTROLLERS, Polymerization, see Control Systems, Process; also Flow; also Temperature; etc.

CONTROLLERS, Power Factor, see Power Factor, also Electric Power Instruments

CONTROLLERS, Pyrometric, see Temperature Controllers

CONTROLLERS, Radio Remote, see Telemetering, also Pressure Transmitter, etc.

CONTROLLERS, Rate-Volume, see Flow

CONTROLLERS, RKVA, see Electric Power Generation Instruments

CONTROLLERS, Stoker, see Boiler Room Instruments

CONTROLLERS, Temperature-Time, see Program Controllers

CONTROLLERS, Thermostatic, see Temperature

CONTROLLERS, Valve, see Valve-Operating Devices

CONTROLS, see Controllers

CONVERTERS, see Transducers, also Pickups

CONVERTERS, AC to DC, including Rotary

Airpax Prods. Co.
Amer. Electronics
Amer. Teler. & Radio
Automatic Electric
Autom. Temp. Contr. Co.
Bendix, Red Bank Div.
Bogue Electric Mfg.
Bristol Co.
Carter Motor Co.
Cornell-Dubilier
Dalmotor Co.
Eicor, Inc.
Electronic Spec. Co.
Electro Insts., Inc.
Electro Prods. Labs.
Electronic Measurements Co.
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Furnas Electric
GE, Apparatus Sales
Gothard Mfg. Co.
Green Rectifier
Heller Co.,
Indust. Test Equipt. Co.
Instrument Corp.
Instrument Devel. Labs
Interelectronics Corp.
International Rectifier
Janette Mfg. Co.
Kellogg Switchboard
Kepco Labs.
LaMarch Mfg. Co.
Magnetic Instr. Co.
Mallory & Co., P. R.
McColpin Christie Corp.
Motordyne, Inc.
Nader Mfg. Co.
Natl. Aircraft Corp.
Opad Electric
Raytheon Mfg. Co.
Rheem Mfg. Co.
Sangamo Electric
Sorensen & Co.
Syntron Co.
Technical App. Builders
Transmag Div.
Varo Mfg. Co.
Walker Div.
Ward Leonard Elect. Co.
Western Gear Corp.
Westinghouse Electric
Weston Electcl. Instr.

CONVERTERS, Analog-to-Digital

Aero Electronics
Ahrendt Instr. Co.
Air Assocs.
Assembly Products
Baird Assocs.-Atomic Instr.
Barnes Engrg. Co.
Bendix, Computer Div.
Bendix-Pacific
Berkeley Div.
Bristol Co.
Coleman Engrg. Co.
Computer Insts. Corp.
Consol. Electrodynamics
Datran Engrg. Corp.
Dayton Instr., Inc.
Electro Insts., Inc.
Electro-Mec Laboratory
Electronic Assocs., Inc.
Electronics Corp. of Amer.
Engrg. & Res. Corp.
Ford Instr. Co.
Franklin Electronics
Genisco, Inc.
Giannini & Co.
Giannini, Datex Div.
Gilmore Industries
Hanson-Gorrill-Brain
Hoover Electronics Co.
Indust. Electronic Engrs.
Industrial Control Co.
Instrument Devel. Labs.
Jackson Co., Byron
Jacobs Instr. Co.
Kearfott Co.
Librascope, Inc.
MacLeod & Hanapol
Metrotype Corp.
Mid-Century Instrumatic
Natl. Aircraft Corp.
Norden-Ketay
Potter Instr. Co.
Radiation Inc.
Rea Company, J. B.
Reeves Instr. Corp.
Streeter-Amet
Telecomputing Corp.
Wang Labs., Inc.
Wiancko Engrg. Co.

CONVERTERS, Binary-to-Decimal

Bendix Aviation Corp.
Berkeley Div.
Clary Corp.
Computer Control Co.
Consol. Electrodynamics
Datran Engrg. Corp.
Electro Insts., Inc.
Fischer & Porter Co.
Franklin Electronics
Giannini & Co.
Giannini, Datex Div.
Indust. Electronic Engrs.
Jacobs Instr. Co.
Kearfott Co.
Metrotype Corp.
Monroe Calc. Mach. Co.
Natl. Aircraft Corp.
Potter Instr. Co.
Radiation Inc.
Rea Co., J. B.
Taller & Cooper
Wang Labs.

CONVERTERS, Digital-to-Analog

Barnes Engrg. Co.
Baird-Assocs.-Atomic Instr.
Bendix-Pacific
Berkeley Div.
Bristol Co.
Datran Engrg. Corp.
Electronic Assocs., Inc.
Engrg. & Res. Corp.
Ford Instr. Co.
Genisco Inc.
Giannini & Co.
Giannini, Datex Div.
Gilmore Industries
Hoover Electronics
Indust. Electronic Engrs.
Jacobs Instr. Co.
Kearfott Co.
Librascope, Burbank Div.
Metrotype Corp.
Mid-Century Instrumatic
Monroe Calc. Mach. Co.
Natl. Aircraft Corp.
Norden-Ketay
Potter Instr. Co.
Radiation Inc.
Rea Co., J. B.
Taller & Cooper
United Electrodynamics
Wang Labs.
Wiancko Engrg. Co.

CONVERTERS, Electric-to-Hydraulic

Bendix Aviation Corp.
Bristol Co.
Engrg, & Res. Corp.
Hagan Corp.
Manning, Maxwell & Moore
Natl. Aircraft Corp.

CONVERTERS, Electric-to-Pneumatic

Bristol Co.
Fischer & Porter Co.
Foxboro Corp.
Hagan Corp.
Manning, Maxwell & Moore
Potter Instr. Co.
Taylor Instr. Cos.

CONVERTERS, Frequency

Ahrendt Instr. Co.
Airpax Products
Amer. Electronics
Amer. Elect. Motors
Automatic Electric
Bendix, Red Bank Div.
Berkeley Div.
Bogue Electric Mfg.
Boonton Radio
Burke Electric
Carter Motor Co.
Commercial Res. Div.
Eicor, Inc.
Electric Spec. Co.
Electro-Voice, Inc.
GE, Apparatus Sales
I-L-S Instr. Corp.
Instr. Devel. & Mfg.
Jack Scient. Instr. Co., Bill
Magnetic Instr. Co.
Metrotype Corp.
Natl. Aircraft Corp.
Philamon Labs.
Potter Aeronaut. Co.
Potter Instr. Co.
Robbins & Myers
Servo Corp. of Amer.
Sorensen & Co.
Technical App. Builders
Tel-Instr. Electronics
Thordarson-Meissner
Trio-Labs., Inc.
Varo Mfg. Co.
Vibration Res. Labs.
Walkirt Co.
Weber Aircraft Corp.
Western Gear Corp.
Westinghouse Electric

CONVERTERS, Magnetic, DC to AC

Aerovox Corp.
Ahrendt Instr. Co.
Airpax Products
Amer. Electronics
Arnoux Corp.
Bogue Elect. Mfg. Co.
Brit. Electronic Sales Co.
Calif. Magnetic Cont. Corp.
Carter Motor Co.
Doelcam, Div.
GE, Apparatus Sales
Interelectronics Corp.
Magnetic Instr. Co.
Magnetic Research Corp.
Motordyne, Inc.
Natl. Aircraft Corp.
Rheem Mfg. Co.
Stator Electric
Timely Insts. & Conts.
Transmag Div.
Varo Mfg.
Wang Labs.
Weber Aircraft Corp.
Western Gear Corp.

CONVERTERS, Punched Card

Ahrendt Instr. Co.
Austin Co.
Berkeley Div.
Computer Control Co.
Electro Insts., Inc.

Epsco, Inc.
Giannini, Datex Div.
Kleinschmidt, Inc.
Librascope, Inc.
Librascope, Burbank Div.
Mid-Century Instrumatic
Moseley Co.
Natl. Aircraft Corp.
North Amer. Instr.
Potter Instr. Co.
Systematics, Inc.
Taller & Cooper
Telecomputing Corp.
Tri-Tronics Co.
Ultrasonic Corp.

CONVERTERS, Punched Tape

Ahrendt Instr. Co.
Austin Co.
Berkeley Div.
Commercial Controls Corp.
Computer Control Co.
Corbett Science Labs.
Electro Insts., Inc.
Epsco, Inc.
Fish-Schurman
Giannini Datex Div.
Librascope, Burbank Div.
Librascope, Inc.
Mid-Century Instrumatic
Moseley Co.
Nuclear Devel. Corp. of Amer.
Potter Instr. Co.
Remington Rand
Systematics Inc.
Taller & Cooper
Telecomputing Corp.
Tri-Tronics Co.
Ultrasonic Corp.

CONVERTERS, Rotary, DC to AC

Barnes Devel. Co.
Bendix, Red Bank Div.
Bogue Electric Mfg.
Carter Motor Co.
Delmotor Co.
Eicor, Inc.
GE, Apparatus Sales
Gothard Mfg.
Interelectronics Corp.
Jack Scient. Instr. Co., Bill
Magnetic Instr. Co.
Maxson Instruments
Motordyne, Inc.
Sangamo Electric
Small Motors, Inc.
Summers Gyroscope
Varo Mfg. Co
Western Gear Corp.
Westinghouse Electric

CONVERTERS, Vibrator, DC to AC

Airpax Prods. Co.
Applied Seience Corp.
Automatic Electric
Avion Div.
Barnes Devel. Co.
Bendix, Eclipse-Pioneer
Bristol Co.
Brunswick Instruments
Calif. Magnetic Cont. Corp.
Carter Motor Co.
Cornell-Dubilier
DuMont Labs., Allen B.
Eicor, Inc.
Electronic Instr. Co.
Electronic Spec. Co.
GE
Giannini & Co.
Industrial Control Co.
Industrial Test Equipt.
Instr. Devel. & Mfg.
James Vibrapowr Co.
Kurman Electronics
Lafayette Instr. Co.
Magnetic Instr. Co.
Magnetic Res. Co.
Mallory & Co., P. R.
Menlo Research Lab.
Millivac Instr. Co.
Minneapolis-Honeywell
Modern Tech. Supply
Nader Mfg. Co.
Precise Measmts. Co.
Rheem Mfg. Co.
Stevens-Arnold
Vibration Research Labs.

CORDS, see Cable

CORDS, Patch

Aerolite Electronics
Aircraft-Marine Prods.
Alden Products
Audio Devel. Co.
Automatic Electric
Berkeley Div.
Coaxial Connector Co.
Donner Scientific
General Radio
Instr. Devel. & Mfg.
Lab-Tronics
Phalo Plastics
Precision Mfg. Co.
Reeves Instr. Corp.
Standard Electric
Std. Elect. Time Co.
Virginia Electronics
Waldon Electronics

CORES, Magnetic, see Magnetic Cores

CORRESPONDENCE SCHOOLS, Instrument Courses

Computer Control Co.
Crow Electri-Craft Corp.
Foxboro Co.
Internat. Corresp. Schools
North Amer. Phillips

COTTERS, External

Albany Prods. Co.
Amer. Chain Div.
Std. Horse Nail

COUNTERS, Alarm

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Anatran. Engrg. Corp.
Autom. Temp. Contr. Co.
Cal-Tronics Corp.
Clevite Res. Center
Counter & Control Corp.
Cook Electric
De-Tec-Tronic Corp.
Durant Mfg.
Electrical & Phys. Instr.
El-Tronics, Inc.
Fischer & Porter
Flett Laboratory
Gaydon Co.
GE
Lumenite Electronic
Martin-Hubbard
Mercoid Corp.
Metrotype Corp.
Nuclear Research
Photobell Co.
Potter Instr. Co.
Production Instr. Co.
Radiation Instr. Devel. Lab.
Rowe Engrg. Co.
Streeter-Amet
Veeder-Root
Western Radiation Lab.

COUNTERS, Batch, see Counters, Predetermined

COUNTERS, Binary

Burroughs Electronics
Computer Counter Co.
Computer-Measmts. Corp.
Daystrom Instrument
Detectolab, Inc.
Electcl. & Phys. Instr.
Hycon Electronics
I-L-S Instr. Corp.
Jacobs Instr. Co.
NRD Instr. Co.
Nuclear-Chicago
Nuclear Corp. of Amer.
Potter Instr. Co.
Radiation Instr. Devel. Lab.
Walkirt Co.
Wang Labs.

COUNTERS, Chart-recording

B-I-F Industries
Bristol Co.
Elect. Tachom. Corp.
Mag Engrg. Co.
Potter Instr. Co.
Radiation Instr. Devel. Lab.
Royson Engrg. Co.

COUNTERS, Colony, see Counters, Micro particle

COUNTERS, Decade

Alcor Electronics
Amer. Tradair Corp.
Anatran Engrg. Corp.
Baird Assocs.-Atomic Instr.
Bendix, Cincinnati Div.
Berkeley Div.
Bowmar Instr. Corp.
Brush Electronics
Burroughs Electronics
Computer-Measmts. Corp.
Dectolab, Inc.
Electl. & Phys. Instr.
Ferrara, Inc.
Freed Transf. Co.
Haydu Brothers
Hewlett-Packard
Hunter Mfg. Co.
I-L-S Instr. Corp.
Indust. Electronic Conts.
Hupp Instrumentation
Jessup Engrg. & Dev.
Kellogg Switchboard
Maxson Instruments
NRD Instr. Co.
Natl. Aircraft Corp.
North Amer. Philips
Nuclear Corp. of Amer.
Nuclear Measmts. Corp.
Nuclear-Chicago
Post Machy. Co.
Potter Aeronaut. Co.
Potter Instr. Co.
Radiation Instr. Devel. Lab.
Ransom Research
Spellman Television
Telecomputing Corp.
Tracerlab, Inc.
Walkirt Co.

COUNTERS, Electrical Impulse

Abrams Instr. Corp.
Advanced Electronics
Aero Instr. Co.
Alcor Electronics
Amer. Electroneering
Amer. Electronic Labs.
Anatran Engrg. Corp.
Automatic Electric
Autom. Temp. Contr. Co.
Baird Assocs.-Atomic Instr.
Bendix Aviation Corp.
Bristol Co.
Butler Mfg.
Cal-Tronics
Cambridge Thermionic
Central Scientific
Cincinnati Time Rec. Co.
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Computer Control Co.
Control Corp.
Control Engrg. Co.
Corbett Science Labs.
Counter & Control Corp.
Cyclotron Specialties
Digitac, Inc.
Dittmore & Freimuth
Durant Mfg. Co.
Eagle Signal Corp.
Elect. & Phys. Instr.
Elect. Tachom. Corp.
Electronic Control Systems
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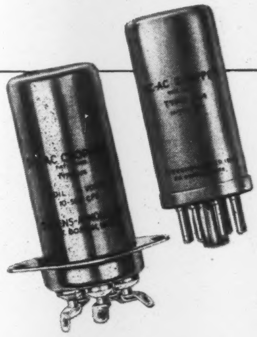

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For 0–500 Cycle Use

All the usual military specifications are met with liberal factors of safety. Before any Chopper is shipped, it is tested twice over the range of −65°C +85°C to give double proof of stamina. Each production lot sample life tested. Please write for Catalog 280.

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CAT. A31
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SOUTH BOSTON

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Operating time 200 microseconds. Mount in any position. Will cover the range of −65°C +85°C and are factory sealed. Please write for Catalog 337.

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SOUTH BOSTON

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1½ WIDTH UNIT WHEEL
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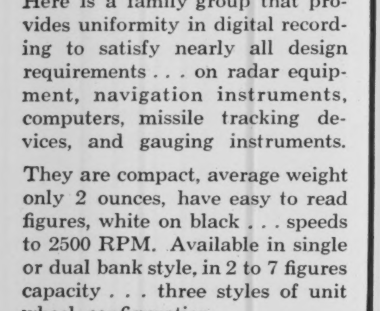

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Hagen Mfg.
Haledy Electronic
Haydon Co., H. W.
Haydu Brothers
Hewlett-Packard
Hunter Mfg.
Hupp Instrumentation
Hycon Electronics
Indust. Electronic Conts.
Industrial Electronics
Internat. Std. Trading
Jack Scient. Instr. Co., Bill
Jessup Engrg. & Devel.
Kearfott Co.
Landis & Gyr
Maxson Instruments
Metrotype Corp.
Mueller Lab.
Nemeth Labs.
Newton Co.
North Electric
Photobell Co.
Photocon Research
Potter Aeronaut. Co.
Potter Instr. Co.
Production Instr. Co.
Radiation Instr. Devel. Lab.
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Richardson Scale
Royson Engrg. Co.
Sangamo Electric
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Thordarson-Meissner
Unimax Switch Div.
Univ. Atomics Corp.
U. S. Instr. Corp.
Veeder-Root
Walkirt Co.
Wang Labs.
Wiancko Engrg. Co.

COUNTERS, Electronic, including Events-per-unit-time (EPUT)

ACF Electronics
Abrams Instr. Co.
Acromark
Adde & Co.
Advance Electronics
Aero Instr. Co.
Ahrendt Instr. Co.
Alcor Electronics
Alina Corp.
Allegany Instr. Co.
Amer. Electroneering
Amer. Electronics Labs.
Amer. Time Prods.
Amer. Tradair Corp.
Anatran Engrg. Corp.
Austin Co.
Automatic Electric
Autom. Temp. Contr. Co.
Autotron Co.
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Baird Assocs.-Atomic Instrs.
Barbour-Stockwell
Bendix, Cincinnati Div.
Berkeley Div.
Bowmar Instr. Corp.
Bristol Co.
Brush Electronics
Burroughs Electronics
Butler Mfg.
Cal-Tronics
Cincinnati Time Recorder
Clary Multiplier
Clevite Res. Center
Computer Control Co.
Computer-Measmts. Corp.
Control Devices, Inc.
Control Engrg. Co.
Cook Electric
Corbett Science Labs.
Counter & Control Corp.
Cramer & Co. Controls Corp.
Cyclotron Specialties
Daytronic Corp.
Detect-O-Ray
Detectron Co.
Devtronics, Inc.
Dittmore & Freimuth
Durant Mfg.
Eagle Signal Corp.
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Electric Speed Indic. Co.
Electrical Devel.
Electl. & Phys. Instr.
Elect. Tachom. Corp.
Electro Insts., Inc.
Electro-Pulse Inc.
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Electronic Control Systems
Electronics Corp. of Amer.
Electronic & Engrg. Serv.
El Mec Labs.
El-Tronics, Inc.
Engineering Res. Assoc.
Federal Telephone & Radio
Ford Instr. Co.
Foxboro Co.
Freed Transf. Co.
GE, Electronics Div.
GE, Telechron Dept.
Gordon Enterprises
Gorrell & Gorrell
Guardian Electric
Haledy Electronic
Hart Mfg. Co.
Haydon Co., A. W.
Haydu Brothers
Hetherington, Inc.
Hewlett-Packard
Hunter Mfg. Co.
Hupp Instrumentation
I-L-S Instr. Corp.
Industrial Elect. Controls
Instrument Lab., Inc.
Jacobs Instr. Co.
Jessup Engrg. & Devel.
Kay Electric
Kearfott Co.
Krohn-Hite
Landis & Gyr
Librascope, Inc.
Little, Inc., Arthur D.
Lumenite Electronic
McDonnell Odometer Co.
Menlo Research Lab.
Metrotype Corp.
Minnesota Electronics
Moisture Register Co.
Natl. Aircraft Corp.
Norden-Ketay
Nuclear-Chicago
Nuclear Corp. of Amer.
Nuclear Measmts. Corp.
Nuclear Research
Pacific Transducer
Paragon Electric
Penn Insts. Div.
Peschel Electronics
Photobell Co.
Post Machinery Co.
Potter Aeronaut. Co.
Potter Instr. Co.
Probescope Co.
Production Instr. Co.
Radiation Insts. Devel. Lab.
Radioactive Prods., Inc.
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Raycon Corp.
Raytheon Mfg.
Rea Co., J. B.
Redington Co.
Richardson Scale
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Scientific Specialties
Shallcross Mfg.
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Stoelting Co.
Stratex Instr. Co.
Streeter-Amet
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Veeder-Root
Victoreen Instr. Co.
Virginia Electronics
Walkirt Co.
Wang Labs.
Westinghouse Electric
Westport Electric
Wilson & Co.
Worner Electronic Devices

COUNTERS, Footage

Adde & Co.
Anatran Engrg.
Barbour Stockwell
Bogue Electric Mfg.
Bristol Co.
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Cook Electric
Counter & Control Corp.
Dittmore & Freimuth
Durant Mfg.
Elect. Tachom. Corp.
Engler Instr. Co.
Freed Transf. Co.
G. M. Mfg. Co.
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Haledy Electronic
Hasler-Tel Co.
Hetherington, Inc.
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Librascope, Burbank Div.
Maxson Instruments
McDonnell Odometer Corp.
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Nuclear Devel. Lab.
Nucleonic Corp.
Olympic Instr. Labs.
Post Machy. Co.
Potter Instr. Co.
Production Instr. Co.
Richardson Scale
Streeter-Amet
Veeder-Root
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COUNTERS, Geiger-Mueller (see also Radioactivity)

Abrams Instr. Co.
Air-O-Tronics
Amer. Instr. Co.
Amer. Tradair Corp.
Amperex Electronic
Anton Electronic Labs.
Atomic Instr. Co.
Atomlab, Inc.
Baird Assocs.-Atomic
Bendix, Eclipse-Pioneer
Bendix, Red Bank Div.
Berkeley Div.
Cambridge Instr. Co.
Can. Rad. & Uran.
Corbett Science Labs.
Cornell-Dubilier
Coulter Electronics
Cyclotron Specialties
Daystrom Instr.
Detectolab, Inc.
Detectron Co.
Distillation Products
Douglas Instr. Labs.
Douglas Radio Labs.
Electrical & Phys. Instr.
Electronic & Engrg. Serv.
Electronic Products
El-Tronics, Inc.
Fisher Res. Lab.
Flett Lab.
Forro Scientific Co.
GE, Apparatus Sales
General Radio Co.
Geophysical Instrument
Georator Corp.
Giannini & Co.
Goldak Co.
Hansen Co., Wm.

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By FREED

Model 2020
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Cold cathode counting and trigger tubes, with simplified circuits, are used throughout which assure years of trouble-free counting service and low power consumption.

Model 2020 is a 4-digit single preset counter capable of controlling any operation that is repeated up to 9,999 times. Any number from 1 to 9,999 may be preset on the 4-digit selector switches. When the preset total has been reached, the counter will provide an output pulse and close contacts on a relay. These outputs may be used simultaneously or separately to stop machines, actuate control signals, or trigger additional equipment.

SPECIFICATIONS

Maximum Count:
Four digits — 9,999

Maximum Counting Rate:
300,000 counts per minute

Input Sensitivity and Waveform: Not critical

Outputs:
Relay contact 10 Amperes
Pulse output 50 volts

Size:
8 x 6 x 12 inches

Weight:
11 pounds

Power: 25 watts
105-125 volts,
50-60 cycles

Price:
$425.00

FREED ALSO MANUFACTURES TOTALIZING, PRESET, AND BATCHING COUNTERS

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Herback & Rademan
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Instruments Inc.
Jordan Electronic Mfg. Co.
Jordan Electronics
Landsverk Electrometer
Leighton Labs., H. W.
Leland Labs., H. W.
Librascope, Inc.
MacDonald Co., W. S.
Menlo Research Lab.
Mt. Sopris Instr. Co.
NRD Instr. Co.
North Amer. Philips Co.
Nuclear-Chicago
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Nuclear Devel. Lab.
Nuclear Measurements Corp.
Nuclear Research
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Nucleonic Corp.
Ohmart Corp.
Pacific Transducer
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Radiation Counter Labs.
Radiation Instr. Dev. Labs.
Radiation Res. Corp.
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Raytheon Mfg.
Raytheon Tube Div.
Servo Corp. of Amer.
Southw. Indust. Electronics
Special Insts. Lab.
Stoelting Co.
Stratex Instr. Co.
Streeter-Amet
Sylvania Elect. Prods.
Technical Associates
Technical Measmt. Corp.
Thordarson-Meissner
Tracerlab Inc.
Ultra-Violet Prods.
United Engineers
Universal Atomic Corp.
Universal X-Ray Prods.
Vacutron, Inc.
Victoreen Instr. Co.
Walkirt Co.
Welch-Allyn Inc.
Western Radiation Lab.
Wilmar Mfg.
Wood Counter Lab.

COUNTERS, Hour, see Timers

COUNTERS, Mechanical, including Stroke

Acromark Co.
Adde & Co.
Advanced Electronics
Ahrendt Instr. Co.
Amer. Time Prods.
Anatran Engrg. Corp.
Atomic Instruments
Autom. Temp. Contr. Co.
Barbour Stockwell
Beam Insts. Corp.
Berkeley Div.
Borg Equipt. Div.
Bowmar Instr. Corp.
Bristol Co.
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Coleman Engrg. Co.
Cook Electric
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Cyclotron Specialties
Dittmore & Freimuth
Durant Mfg.
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Elect. Tachom. Corp.
Endevco. Corp.
Engr. Res. & Devel.
Fischer & Porter
Ford Instr. Co.
Genisco, Inc.
Gordon Enterprises
Gorrell & Gorrell
Guardian Electric
Hagen Mfg.
Haledy Electronic
Hart Mfg. Co.
Hycon Electronics
Impact Register
Internat. Register Co.
Kearfott Co.
Landis & Gyr
May Engrg. Co.
McDonnell Odometer Co.
Moisture Register Co.
Opplem Co.
Photocon Research
Potter Instr. Co.
Production Instr. Co.
Ram Meter, Inc.
Raycon Corp.
Redington Co.
Richardson Scale
Streeter-Amet
Taller & Cooper
Veeder-Root
Walkirt Co.

COUNTERS, Microparticle

Amer. Optical
Central Scientific
Fisher Scientific
Fish-Schurman
Optionic Research, Inc.
Phoenix Prec. Instr.
Sargent & Co.

COUNTERS, Photoelectric

ACF Electronics
Alcor Electronics
Amer. Electronic Labs.
Autotron Co.
Avion Div.

Berkeley Div.
Cal-Tronics Corp.
Computer-Measmts. Corp.
Corbett Science Labs.
Davenport Mfg. Co.
Daytronic Corp.
Detect-O-Ray
De-Tec-Tronic Labs.
Dittmore & Freimuth
Durant Mfg. Co.
Electronic Controls Corp.
Electronic Prods. Co.
Electronics Corp. of Amer.
Electro-Physics Co.
El-Tronics, Inc.
Engrg. Res. & Devel.
Ess Instr. Co.
Fisher-Pierce
Flett Lab.
Freed Transf. Co.
GE
Haledy Electronic
Hewlett-Packard
Hupp Electronics
Hunter Mfg.
Indust. Electronic Conts.
Industrial Electronics
Internat. Std. Trading
Kaye Devel. Co.
Lumenite Electronic
Magnetic Amplifiers Inc.
Metrotype Corp.
NRD Instr. Co.
Optionic Research, Inc.
Phoenix Prec. Instr.
Photobell Co.
Post Machinery
Potter Instr. Co.
Production Instr. Co.
Rockwell Engrg. Co.
Scientific Specialties
Sherron Metallic Corp.
Spellman Television
Standard Elect. Time
Standard Piezo
Sticht Co., Herman H.
Streeter-Amet
Sunshine Scientific
Telecomputing Corp.
Thordarson-Meissner
Tri-Tronics Co.
Vacutron, Inc.
Veeder-Root
Walkirt Co.
Weston Electcl. Instr.
Worner Electronic Devices

COUNTERS, Predetermined, including Batch

Adde & Co.
Alcor Electronics
Anatran Engrg. Co.
Autom. Temp. Contr. Co.
Baird Assocs.-Atomic
Bendix, Cincinnati
Berkeley Div.
Burroughs Corp.
Cal-Tronics Corp.
Computer-Measmts. Corp.
Control Devices, Inc.
Corbett Science Labs.
Counter & Control Corp.
Detectron Co.
Durant Mfg.
Eagle Signal Corp.
Electrical Devel.
Electl. & Phys. Instr.
Electro-Pulse, Inc.
Emmett Mach. & Mfg.
Endevco Corp.
Engrg. Research
Ferrara, Inc. Co.
Fischer & Porter Co.
Freed Transf. Co.
Genisco, Inc.
Hetherington, Inc.
Hunter Mfg. Co.
Hupp Instrumentation
I-L-S Instr. Corp.
Indust. Electronic Conts.
Industrial Electronics, Inc.
Jessup Engrg. & Devel.
Kellogg Switchboard
Landis & Gyr
Marconi Instruments
Metrotype Corp.
Nemeth Labs.
North Amer. Philips
Nucleonic Corp.
Nucleonic Corp. of Amer.
Penn Insts. Div.
Photobell Co.
Photocon Research Prods.
Post Machinery Co.
Potter Aeronaut. Co.
Potter Instr. Co.
Probescope Co.
Production Instr. Co.
Ransom Research
Raycon Corp.
Richardson Scale
Scientific Specialties
Special Instruments Lab.
Spellman Television
Standard Elect. Time
Streeter-Amet
Taller & Cooper
Telechron Dept.
Veeder-Root
Walkirt Co.
Weighing Components
Westport Electric
Westronics, Inc.
Wilson & Co.

COUNTERS, Radiation, see Counters, Geiger-Mueller, also Radioactivity Instruments

COUNTERS, Revolution

Adde & Co.
Alcor Electronics
Anatran Engrg. Corp.
Autom. Temp. Contr. Co.
Baird Assocs.-Atomic Instr.
Barbour Stockwell
Berkeley Div.
Boulin Instr. Corp.
Bowmar Instr. Corp.
Bristol Co.
Brown & Sharpe
Coleman Engrg. Co.
Computer-Measmts. Corp.
Cook Electric
Counter & Control Corp.
Cummings Mach. Wks.
Cyclotron Specialties
Detectron Co.
Dittmore Freimuth
Dormitzer Electric
Durant Mfg. Co.
Eagle Signal Corp.
Elect. Tachom. Corp.
Electro-Pulse, Inc.
Endevco Corp.
Engler Instr. Co.
Engrg. Res. & Devel.
Freed Transf. Co.
GE, Apparatus Sales
General Radio
Genisco, Inc.
Gordon Enterprises
Greiner Co., Emil
Gurley, W. & L. E.
Hart Mfg. Co.
Hasler-Tel Co.
Hupp Instrumentation
Ideal Commutator
Industrial Elect. Controls
Industrial Timer Corp.
I-L-S Instr. Corp.
Jaeger Watch
Johnson Co., E. F.
Jones Motrola Corp.
Kearfott Co.
Krohn-Hite
Marx Co., Clarence T.
Mason-Neilan Div.
McDonnell Odometer
Millen Mfg. Co.
Millers Falls Co.
Moisture Register Co.
Mueller Laboratory
Pacific Scientific
Photocon Research
Potter Instr. Co.
Production Instr. Co.
Ransom Research
Raycon Corp.
Redington Co.
Richardson Scale
Scherr Co.
Std. Elect. Time Co.
Starrett Co., L. S.
Streeter-Amet
Sticht Co., Herman H.
Sun Electric
Taller & Cooper
Telecomputing Corp.
Veeder-Root, Inc.
Walkirt Co.
Warren-Knight
Westport Electric
Zernickow Co.

COUNTERS, Scintillation (see also Radioactivity)

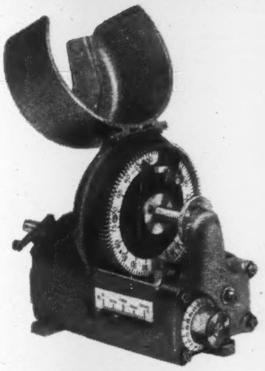
Amer. Electronics
American Tradair Corp.
Anton Electronics Labs.
Baird Assocs.-Atomic Instr.
Berkeley Div.
Beva Laboratory
Chatham Electronics
Corbett Science Labs.
Curtiss-Wright
Daystrom Instrument
Detectolab, Inc.
Detectron Co.
Douglas Radio Labs.
Electl. & Phys. Instr.
Electronic & Engrg. Serv.
El-Tronics, Inc.
Fisher Res. Lab.
Forro Scientific
GE, Apparatus Sales
Goldak Co.
Hansen Co., Wm.
Hewlett-Packard
Internat. Standard
Kaye Devel. Co.
Levinthal Electron. Prods.
Librascope, Inc.
Menlo Research Lab.
Mt. Sopris Instr. Co.
NRD Instr. Co.
Natl. Radiac, Inc.
North Amer. Philips Co.
Nuclear-Chicago
Nuclear Corp. of Amer.
Nuclear Measmts. Corp.
Nuclear Research Corp.
Nuclear Science & Engrg.
Nucleonic Co.
Packard Instr. Co.
Potter Instr.
Prec. Radiation Insts.
Radiation Counter Labs.
Radiation Instr. Devel. Lab.
Radiation Res. Corp.
Radioactive Prods. Inc.
Stratex Inst.
Technical Associates
Telecomputing Corp.
Tracerlab Inc.
Victoreen Instr. Co.
Western Radiation Lab.
Wood Counter Lab., N.
Universal Atomics Corp.

COUNTERS, Time, see Timers

COUNTERS, Vehicular

Aero Instr. Co.
Aristo Import Co.
Barbour Stockwell
Computer-Measmts. Corp.
Corbett Science Labs.
Dittmore & Freimuth
Engler Instr. Co.
GE
Presin Co.
Stoelting Co.
Streeter-Amet
Taller & Cooper
Veeder-Root

COUNT-REGULATED CIRCUIT CONTROL WITH AUTOMATIC RECYCLING

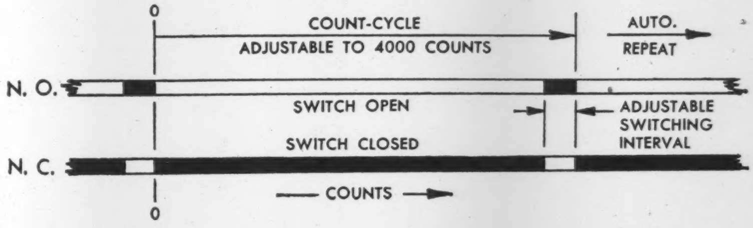


CYCLO-MONITOR
Write for Bulletin 202-1

CYCLO-MONITOR

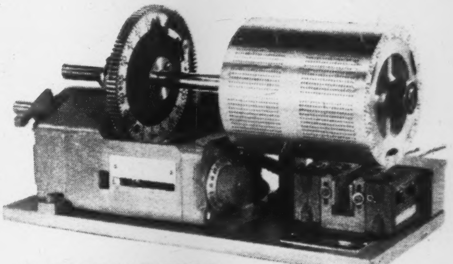
COUNTS: Shaft Revolutions
Lever Strokes
Electric Impulses

CONTROLS: Machines and processes on a repeat cycle basis. No reset required. No pause or lag in recycling—even at continuous speeds. Positive gearing throughout. Integral, SPDT switch transfers as shown in typical cycle diagram below:

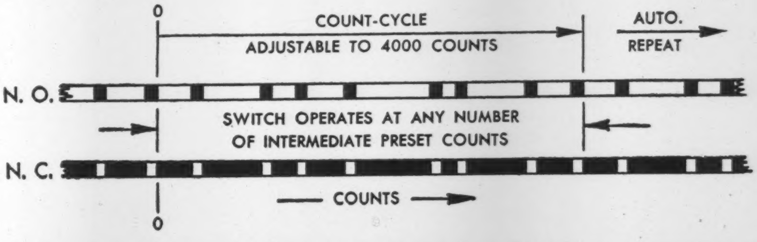


PROGRAMONITOR

An advanced recycling, circuit-controlling counter for complex and irregular switching patterns with any number of intermediate switching points. Complete flexibility for pattern changes. Automatic, instantaneous recycling.



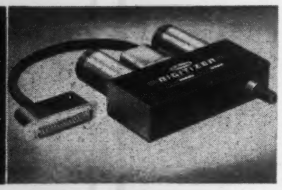
PROGRAMONITOR
Write for Bulletin 505


0
COUNT-CYCLE
ADJUSTABLE TO 4000 COUNTS
AUTO.
REPEAT
N. O.
SWITCH OPERATES AT ANY NUMBER
OF INTERMEDIATE PRESET COUNTS
N. C.
COUNTS
0

COUNTER AND CONTROL CORPORATION

5230 W. ELECTRIC AVE. • MILWAUKEE 19, WIS.

For more information circle **111** on inquiry card.



Automation
Data Reduction
Digital Systems

These electromechanical products designed and manufactured by Coleman can save you money by speeding up data reduction and increasing accuracy.

DIGITIZER® (see illustration)—A shaft position decimal converter which actuates card or tape punching machines, printers, and other data storing or indicating devices. Digitizers are used in AUTOMATION systems to digitally start and stop mechanical motion.

OSCILLOGRAM READER—By recording trace deflection measurements directly into punched card machines, reading time can be speeded up by a factor of 7 to 10. Practically no operator experience is necessary to achieve fast and highly accurate results.

BROWN RECORDER KIT—Most models of Brown Recorders can be converted for digital readout in a matter of minutes.

POWERED COMPARATOR—A machine which measures image position on 5½-inch film to an accuracy of ±.00039 inches and automatically records this digitally in data storing and tabulating machines.

BOREADER—A machine for reading 35mm phototheodolite camera film to an accuracy of ±.00039 inches and automatically recording up to 44 digits onto punched cards with the push of a button.

BINARY DIGITIZER—A shaft position binary converter which produces unambiguous straight binary output in capacities up to 15 bits.

Write for brochures describing these and other products. Representatives in many cities. All inquiries are promptly answered directly from the factory.

Coleman ENGINEERING COMPANY, INC.
6040 West Jefferson Blvd. Los Angeles 16, Calif

For more information circle **112** on inquiry card.

COUPLERS, Directional, see Microwave Instrumentation

COUPLINGS, see Fittings, Tube

COURSE PROTRACTORS, see, Protractors, Course

COVERS, Instrument, including Dustproof and Waterproof (see also Cases)

Amer. Hard Rubber Co.
Bausch & Lomb
Bel-Art Products
Blossom Mfg.
Bud Radio, Inc.
Carroll Co., J. B.
Conn-Craft Co.
Daniels, Inc.
Dearborn Glass Co.
Fisher Scientific
Harris Mfg. Co.
Instrument Cases Inc.
Instruments Inc.
Insuline Corp. of Amer.
Lancaster Lens
Lewyt Corp.
Potter & Brumfield
Printloid Corp.
Reiner Electronics Co.
Scientific Instr. Co.
Swanson Engrg.
Trerice Co.
U. S. Rubber
Valley-National
Warwick Prods. Co.
Watertown Mfg.
Zero Mfg. Co.

CRIMINOLOGY LABORATORY APPARATUS (see also Polygraphs)

Amer. Instr. Co.
Amer. Optical Instr.
Applied Research Labs.
Baird Assocs.-Atomic Instr.
Beckman Div.
Eitzen Co., Louis C.
Fisher Scientific
Hanovia Chem. & Mfg.
Jarrell-Ash
Menlo Research Lab.
Stoelting Co.
Ultra-Violet Prods.

CRYOSTATS

Perkin-Elmer

CRYPTOMETERS, Paint

Bausch & Lomb
Drage Products
Koehler Instr. Co.

CRYSTAL DIODES

Amperex Electronics
Bendix Aviation Corp.
Centralab Div.
Fretco, Inc.
GE, Electronics Div.
Germanium Prods. Corp.
Hughes Prods. Div.
International Rectifier
Kemtron Electron Prods.
Microwave Assocs.
Pac. Semiconductors, Inc.
Radio Receptor Co.
Raytheon Tube Div.
Sylvania Elect. Prods.
Transitron Electronic Corp.

CRYSTAL ELECTRODES

Constantin & Co., L. L.
Fineisen, A. R.
Sylvania Elect. Prods.
Valpey Crystals

CRYSTAL HOLDERS

Amer. Electronic Labs.
Centralab Div.
Corning Glass Works
Constantin & Co.
Diamond Mfg. Corp.
Electrical Industries, Inc.
Grayhill
Insuline Corp.
Johnson Co., E. F.
Millen Mfg. Co.
Molded Insulation Co.
Premier Res. Labs.
Sierra Electronic
Sylvania Elect. Prods.

CRYSTALS, Barium Titanate

Bendix-Pacific
Branson Instruments
Brush Electronics
Centralab Div.
Dyna-Empire
Endevco Corp.
Erie Resistor
Lab. Optical
Levinthal Electronic
Stupakoff Div.

CRYSTALS, Germanium

Centralab Div.
Genl. Transistor Corp.
Germanium Prods. Corp.
International Rectifier
Natl. Aircraft Corp.
Radio Receptor Co.
Semimetals, Inc.
Texas Insts., Inc.

CRYSTALS, Piezoelectric

Bausch & Lomb
Bio-Rad Labs.
Bliley Electrical
Branson Instruments
Brush Electronics
Centralab Div.
Clevite Res. Center
Crystal Research Labs.
Dearborn Scientific
E & W Optical
Endevco Corp.
Esco Prods. Co.
GE
General Radio Co.
Gulton Mfg.
Helio Instr. Co.
Hupp Electronics
Internat. Crystal Mfg.
Keystone Electronics Co.
Knights Co.
McCoy Electronics
North Amer. Philips
Premier Res. Labs.
RCA Div.
Reeves Hoffman Corp.
Standard Arcturus
Stupakoff Div.
Valpey Crystal Corp.
Vectron, Inc.

CRYSTALS, Quartz, Rochelle Salt

Baker Chem. Co.
Baird Assocs.-Atomic Instr.
Bendix Aviation Corp.
Bio-Rad Labs.
Bliley Electric
Bodnar Industries
Branson Instruments
Brush Electronics
Clevite Res. Center
Crystal Research Labs.
Dearborn Scientific
E & S Optical
E & W Optical
Endevco Corp.
Fecker, Inc.
Fish-Schurman
Flett Laboratory
Fuess, Inc.
Gaertner Scientific
G.E., Electronics Div.
General Radio Co.
Harvey Radio Labs.
Helio Instr. Co.
Hupp Electronics
Internat. Crystal Mfg.
Internat. Devel. Co.
Internat. Std. Trading
Kaar Engrg. Co.
Keystone Electronics
Knights Co.
McCoy Electronics
North Amer. Philips
Premier Res. Labs.
RCA Div.
Reeves Hoffman Corp.
Standard Arcturus
Unertl Optical
Valpey Crystal Corp.
Vectron, Inc.
Wallace & Tiernan
Western Electric

CRYSTALS, Rock Salt, Optical

Fish-Schurman
Fretco, Inc.
Harshaw Chemical
Internat. Optical
Mann Co., Wm. I.
Natl. Tech. Labs.
Palos Optical
Perkin-Elmer
Regal Instr. Co.
Unertl Optical

CRYSTALS, Tourmaline

Bio-Rad Labs.
Clevite Res. Center
Dearborn Scientific
Endevco Corp.
Fecker, Inc.
Fuess, Inc.
Helio Instr. Co.
Knights Co.
Premier Res. Labs.
Radiation Counter Labs.
Unertl Optical
Valpey Crystal Corp.
Zeiss, Inc., Carl

CRYSTALS FOR WATCHES, GAGES, etc.

Amersil Co., Inc.
Bache & Co., Semon
Buhl Optical
Dearborn Glass
Edna Lite Co.
Elgin Natl. Watch
Felsenthal & Sons
Ferner Co.
Fish-Schurman
Gallien, R. P.
Germanow-Simon
Imetra Co. Ltd.
Inlaid Optical
Lancaster Lens
Marsco Mfg.
Marshall Co.
Modern Tech. Supply
Molded Insulation Co.
New Haven Clock
Parisian Novelty Co.
Printloid Co.
Regal Instr. Co.
Rohm & Hass
Sickles & Sons
Sillcocks-Miller
Steel Co., Herman D.
Swiss Jewel Co.
Valley Natl. Corp.

CUBIC FOOT BOTTLES, see Specific Gravity Bottles

CUBICLES, see Panels

CURRENT INDICATORS, see Ammeters

CURRENT LIMITERS, see Current Regulators

CURRENT REGULATORS, including Ballast Tubes

Abrams Instr. Co.
Advanced Electronics
Amperex Electronic Corp.
Amperite Co.
Amplifier Co.
Anton Electronics Labs.
Askania Reg. Co.
Assembly Products
Automatic Electric
Autom. Temp. Contr. Co.
Avion Div.
Bart-Messing
Beck Bros.
Bendix, Eclipse-Pioneer
Bendix, Red Bank Div.
Betts & Betts
Bogue Electric Mfg.
Bradley Labs.
Bristol Co.
Brit. Electronic Sales
Burlington Instr. Corp.
Burndy Engrg. Co.
CBS-Hytron Div.
Cal-Tronics Corp.
Chatham Electronics
Clarostat Mfg.
Conoflow Corp.
Cook Electric
Cutler-Hammer
Devtronics Inc.
DoAll Co.
Doelcam Div.
Donner Scientific
Dressen-Barnes
Edison, Inc. Thomas
El Mec Labs.
Electric Reg. Corp.
Electrical & Phys. Instr.
Electronic Measurements Co.
Electronic Products
Electronic Research Assoc.
Electrosig Corp.
ElMec Magnetics
Engineered Magnetics Div.
Federal Telephone & Radio
Fielden Instr. Div.
Fisher-Pierce
Furst Electronics
G-V Controls Inc.
General Controls
GE, Apparatus Sales
GE, Tube Dept.
General Magnetics
Hagan Corp.
Hevi Duty Electric
Industro, Inc.
Inet Inc.
Kepco Labs.
Larson Instr. Co.
Lectronic Research
Lewis & Co., J. B.
Magnetic Amplifiers
Magnetic Instr. Co.
Magnetic Research Corp.
Manning, Maxwell & Moore
Nankervis Co., G. L.
Ohmite Mfg.
Olympic Devel. Co.
Peschel Electronics
Philco Corp.
Precise Measmts. Co.
RCA Div.
Raytheon Mfg.
Richardson-Allen
Rockwell Engrg. Co.
Roller-Smith
Rubicon Co.
Shallcross Controls
Sherron Metallic Corp.
Sola Electric
Sorensen & Co.
Square D Co.
Streeter-Amet
Teletronics Lab.
Thermo Electric Mfg.
Thordarson-Meissner
Tung-Sol Electric
United Transf. Co.
Victoreen Instr. Co .
Victory Engrg. Corp.
Westinghouse Electric
Wilson & Co., G. C.

CURVE FOLLOWERS (see also X-Y Recorders)

Aero Electronics
Alabama Automation Corp.
Berkeley Div.
Corbett Science Labs.
Electro Insts., Inc.
Electronic Assocs.
Geotechnical Corp.
Instrument Devel. & Mfg.
Logistics Research
Marconi Instruments
Mid-Century Instrumatic
Moseley Co.
Potter Instr. Co.
Scientific Specialties
Sterling Precision
Telecomputing Corp.
Westronics, Inc.

CURVE TRACERS, see Drawing Instruments

CUTTERS, Midget Milling

Fineisen., A. R.
Gallien, R. P.
Gorton Machine Co.
Grobet File Corp.
Howard Clock
Jensen Mfg. Co.
Pratt & Whitney
Preis Engraving Mach.
Severance Tool Industs.
Steel Co., Herman D.
Willey's Carbide Tool Co.
Woodruff & Stokes

CYCYE CONTROLLERS, see Counters, also Timers; (also Program Controllers)

CYCLOMETERS

Penn Insts. Div.
Veeder-Root

CYLINDERS, Air and/or Hydraulic

Accessory Prods. Corp.
Airmatic Valve, Inc.
Allen Co.
Annin Co.
Autoclave Engrs., Inc.
Bellows Co.
Bendix Aviation Corp.
Carruthers & Fernandez
Cash Co., A. W.
Conoflow Corp.
Cooper Co.
DeZurick Shower Co.
Foxboro Co.
Gadgets, Inc.
Hagan Co.
Hanna Engrg. Works
Hannifin Mfg. Co.
Hoke, Inc.
Instrument Devel. & Mfg.
Johnson Service
Lear, Inc.
Leedeen Mfg.
Lindberg Engrg. Co.
Logansport Machine, Inc.
Mead Specialties Co.
Natl. Pneumatic Co.
Pegasus Labs.
Rahn & Co.
Rivett Lathe & Grinder
Schrader's Son
Studebaker Hydraulic Prods.
Swanson Engrg. Co.
Taylor-Winfield
Vickers, Inc.
Westinghouse Air Brake Co.

CYLINDERS, GRADUATING, see Laboratory Apparatus

CYLINDERS, Rubber

Atlantic India Rubber
Genl. Tire
Goodrich Co., B. F.
Luzerne Rubber
Raybestos-Manhattan
U. S. Rubber

DAMPERS, PRESSURE, see Pressure Snubbers

DAMPING TESTING EQUIPMENT and INSTRUMENTS (see also Impact)

Baldwin-Lima-Hamilton
Farnsworth Electronics
Genisco, Inc.
Industrial Control Co.
Kinetic Instr. Co.
Lessels & Assoc.
M. B. Mfg. Co.
Oltronix Co.
Wiancko Engrg. Co.

D'ARSONVAL MOVEMENTS (see also Electrical Indicators, also Voltmeters, Ammeters, etc.)

Assembly Products
Bristol Co.
DeJur-Amsco
Edin Co.
Elect. Design & Mfg.
GE, Apparatus Sales
Meters, Inc.
Phaostron Co.
Rubicon Co.
Sendur Mfg. Co.
Sensitive Res. Instr.
Simpson Electric
Sun Electric
WacLine, Inc.
Welch Mfg. Co., W. M.

D'ARSONVAL-TYPE CONTROLLERS, including Meter-Relays, Contact Meters, etc.

Assembly Products
Bristol Co.
Edison, Inc., Thomas A.
Larson Instr. Co.
Marion Electcl. Instr.
Minneapolis-Honeywell
Sensitive Res. Instr.
Simpson Electric
Weston Electcl. Instr.

DATA-HANDLING SYSTEMS, see Data Processing Systems

DATA-PROCESSING SYSTEMS (see also Computers, also Printers)

ACF Electronics
Aero Electronics
Ahrendt Instr. Co.
Air Associates
Air Research Mfg.
Amer. Helicopter Div.
Anelex Corp.
Austin Co.
Autonetics Div.
Bendix-Pacific
Benson-Lehner
Berkeley Div.
Bristol Engrg. Co.
Burroughs Electronics
Century Electronics & Inst.
Coleman Engrg. Co.
Commercial Controls Corp.
Computer Controls Co.
Consol Electrodynamics
Corbett Science Labs.
Davies Labs., Inc.
Donner Scientific
Electro Insts., Inc.
ElectroData Corp.
Electronic Control Systems
Electronics Corp. of Amer.
Epsco, Inc.
Exact Weight Scale Co.
Farnsworth Electronics
Ferranti Electric
Fielden Instr. Div.
Fischer & Porter Co.
Fish-Schurman
Ford Instr. Co.
Franklin Electronics
Friden Calc. Mach. Co.
Geotechnical Corporation
Genisco, Inc.
Giannini & Co.
Hanson-Gorrill-Brian
Hoover Electronics
Indikon Company
Industrial Electronic Engrs.
Internat. Busines Mach.
Kleinschmidt, Inc.
L & O Res. & Devel.
Leeds & Northrup
Librascope, Inc.
Logistics Research
Marchant Calculators
Metrotype Corp.
Minneapolis-Honeywell
Monroe Calc. Mach. Co.
Moseley Co.
Mountain Systems, Inc.
Nelson Instr. Co.
Newton Co.
Nuclear Devel. Corp.
Nuclear Corp. of Amer.
Panellit, Inc.
Post Machinery Co.
Potter Instr. Co.
Radiation Inc.
Rea Co., J. B.
Remington Rand
Rheem Mfg.
Shepard Labs.
Stavid Engrg., Inc.
Sterling Prec. Corp.
Taller & Cooper
Taylor Instr. Cos.
Technitrol Engrg. Co.
Telemeter Magnetics, Inc.
Telecomputing Corp.
Texas Insts., Inc.
Ultrasonic Corp.
United Electrodynamics
Wang Labs.
Westronics, Inc.
Wiancko Engrg. Co.

DATA-REDUCTION SYSTEMS, see Data Processing Systems

Now You Can "LOG IT YOURSELF"!

Use a DATA-LINER® Universal Logger
by Hanson-Gorrill-Brian

If you're recording data, you can eliminate service problems and systems engineering with the DATA-LINER Universal Logger. Flexibility is the key word here, achieved with "building blocks" of packaged functional elements which plug together to form a completely integrated system.

Attractively housed, the DATA-LINER Universal Logger meets all system requirements with these outstanding features: modular construction; simple change of data format by operators; easy expansion in the number of typewriters, number of inputs, or type of inputs.

Write or wire today for complete details.

b-g-b HANSON-GORRILL-BRIAN, INC.
GLEN COVE, N. Y.

For more information circle **113** on inquiry card.

DATA-TRANSMISSION SYSTEMS, see Telemetering

DEADWEIGHT TESTERS, see Pressure Instrument Calibrators, Deadweight

DECADE BOXES, Resistance, Capacitance, Inductance, etc.

Aero Electronics
Aerovox Corp.
Alco Electronics
Berkeley Div.
Brist. Electronics Sales
Central Scientific
Cinema Engrg. Co.
Coaxial Connector Co.
Consol. Resistance Co.
Cornell Dubilier
Daigger & Co.
Daven Co.
Eastern Prec. Resistor
Electro Measurements, Inc.
Electronic Instr. Co.
Electronic Measmts. Co.
Endevco Corp.
Federal Telephone & Radio
Freed Transf. Co.
GE, Instr. Dept.
Gray Instr. Co.
Hycor Div.
Industrial Insts., Inc.
Leeds & Northrup
Mid-Century Instrumatic
Ohmite Mfg. Co.
Physics Research Labs.
Reiner Electronics
Rochester Electronics
Rubicon Co.
Scientific Specialties
Shallcross Mfg.
Shasta Div.
Simmonds Aerocessories
Southern Electronics
Telex, Inc.
United Optical
United Transf. Corp.
Welch Mfg. Co., W. M.

DECADE COUNTERS, see Counters, Decade

DECALCOMANIAS

Brady Co., W. H.
Chicago Decalcomania
Consolidated Decal.
Internat. Decalcomania
Meyercord Co.
Miller Dial & Name Pl.
Natl. Decalcomania
Palm Bros. Decalcomania
Park Nameplate Co.
Photoplating Co.
Switzer Bros.

DECELEROMETERS, see Accelerometers

DECIBEL METERS, see Sound Level Indicators

DEEP SEA INSTRUMENTS

Atlantic Research
Bendix-Pacific
Bristol Co.
Brush Electronics
Chesapeake Instr.
Colvin Labs., Inc.
Dittmore & Freimuth
General Precision
Kahl Scient. Instr.
Moeller Instr. Co.
Raytheon Mfg. Co.
Taylor Instr. Cos.
Trimount Instr. Co.
Varo Mfg. Co.
Weksler Thermonm. Corp.
Wiancko Engrg. Co.

DEFLECTION TESTERS, Light Wave

Acme Industrial
Bowser, Inc.
Engis Equipt. Co.
Gaertner Scientific
Industrial Test Equipt.
Opplem Co., Inc.
Sherron Metallic Corp.
Van Keuren Co.

DEFORMETERS

Baldwin-Lima-Hamilton
Dietert Co.

DEHUMIDIFIERS, see Air Dryers

DEHYDRATORS, see Air Dryers

DELAY LINES

Advance Electronics
Aerolite Electronics
Aerovox Corp.
Aircraft-Marine Prods.
Alden Products
Andersen Labs.
Alto Scientific
Bellmore Gear
Bliley Electric
Brew & Co., Richard D.
Burnell & Co.
Burroughs Corp.
C.G.S. Labs.
Carad Corp.
Centralab Div.
Coaxial Connector Co.
Colortone Electronics
Columbia Technical Corp.
Control Electronics Co.
Corning Glass Works
Daven Co.
Dectectolab, Inc.
Dietz Design & Mfg.
Dilectron Div.
DuMont Labs., Allen B.
ESC Corp.
Electl. & Physical Instr.
Empire State Labs.
Epsco, Inc.
Freed Transf. Co.
Gudeman Co.
Gulton Mfg.
Helipot Div.
Jacobs Instr. Co.
Lab. for Electronics
MacLeod & Hanopol
May Engrg. Co.
Micamold Electronics
Millen Mfg. Co.
Natl. Aircraft Corp.
Orbitran Co.
PCA Electronics
Raytheon Mfg. Co.
Shallcross Mfg.
Sibley Co.
Sickles Div.
Sprague Electric
Technitrol Engrg. Co.
Texas Insts., Inc.
Tobe Deutschmann
Underwood Corp.
United Transf. Corp.
Valpey Crystals
Wickes Engrg. & Constr.

DELINEASCOPES

Bausch & Lomb
Beseler Co.
Ercona Corp.
Gordon Enterprises
Jarrel-Ash

DEMAGNETIZERS

Aero Electronics Co.
Annis Co.
Ideal Industries, Inc.
Kendrick & Davis
Kinevox
Librascope, Burbank Div.
Lufkin Rule Co.
Magnaflux Corp.
Magnetic Instr. Co.
Martindale Electric
Newall Mfg. Co.
Opad Electric
Radio Frequency Labs.

DEMAND, Indicators or Recorders, see Load Indicators, Electrical

DEMODULATORS, Electronic

Ahrendt Instr. Co.
Autom. Temp. Contr. Co.
Bendix-Pacific
Century Geophysical
Empire State Labs.
Industrial Control Co.
Magnetic Instr. Co.
Pace Engrg. Co.
Polytechnic Res. & Devel.
Servo Corp. of Amer.
Torwice Electronics, Inc.
Ultradyne Engrg. Labs.
Virginia Electronics
Wiancko Engrg. Co.

DENSITOMETERS, Gas and/or Liquid, including Densimeters, Microdensitomers, etc. (see also Specific Gravity)

Agfa Ansco
Amer. Instr. Co.
Applied Research Labs.
Baird Assocs.-Atomic Instr.
Bausch & Lomb
Bendix Aviation Corp.
Biddle Co., James G.
Brinkmann Instruments
Bristol Co.
Cambridge Instr. Co.
Dearborn Scientific
Eastman Kodak
Electronics Corp. of Amer.
Epic, Inc.
Ess Instr. Co.
Farrand Optical
Ferner Co.
Fish-Schurman
Fischer & Porter Co.
Fisher Scientific
Foxboro Co.
Gaertner Scientific
GE
Gordon Enterprises
Hall Sonic Engrg. Co.
Hayes Scientific
Henson Co.
Hogan Labs.
Instrument Devel. Labs.
Jarrell-Ash
Kaye Devel. Co.
Liquidometer Corp.
Macbeth Corp.
Mfrs. Engrg. & Eqiupt.
Maxson Instr. Div.
Mico Instr. Co.
Mt. Sopris Instr. Co.
Natl. Spectrographic Labs.
North Amer. Philips
Nuclear Corp. of Amer.
Ohmart Corp.
Permutit Co.
Pfaltz & Bauer
Phoenix Prec. Instr.
Photo Research Corp.
Photovolt Corp.
Poole Instruments
Potter Aeronaut. Co.
Prec. Thermom. & Insts.
Radioactive Prods., Inc.
Rainhart Co.
Rockwell Engrg. Co.
Simmonds Aerocessories
Sipp-Eastwood Corp.
Spinco Div.
Testing Machines, Inc.
United Engineers
Vectron, Inc.
Welch Mfg. Co., W. M.
Weston Electcl. Instr.
Williams, Brown & Earle
Zeiss, Inc., Carl
Zoomar Corp.

DENSITOMETERS, Optical

Baird Assocs.-Atomic Instr.
Bausch & Lomb
Bronoptics Co.
Ercona Corp.
Fish-Schurman
Gaertner Scientific
Helio Instr. Co.
Instr. Devel. Labs.
Jarrell-Ash
Mfrs. Engrg. & Equipt.
Phoenix Prec. Instr.
Photovolt Corp.
Scientific Specialties
Specialized Insts. Corp.
Std. Electronic Res.
Testa Mfg. Co.
Welch Mfg. Co., W. M.
Will Corp.
Zoomar Corp.

DENSITOMETERS, Photographic

Applied Research Labs.
Baird Assocs.-Atomic Instr.
Gordon Enterprises
Mason Instr. Co.
Mt. Sopris Instr. Co.
Phoenix Prec. Instr. Co.
Photo Res. Corp.
Scientific Specialties
Shepard Labs.
Vectron, Inc.
Welch Mfg. Co., W. M.
Weston Electcl. Instr.
Zoomar Corp.

DENSITY CONTROLLERS

Acme Reg. Co.
Askania Reg. Co.
Autom. Temp. Contr. Co.
Autom. Valve Control
Bailey Meter Co.
Bendix, Cincinnati Div.
Black, Sivalls & Bryson
Bristol Co.
Brooke Engrg. Co.
Climax Div.
Cutler-Hammer
De-Tec-Tronic Corp.
Ess Instr. Co.
Fielden Instr. Div.
Fischer & Porter Co.
Fish-Schruman
Foxboro Co.
Gaydon Co.
General Controls
Hagan Corp.
Hays Corp.
Indust. Nucleonics
Instruments Inc.
Larson Instr. Co.
Leeds & Northrup
Lumenite Electronics
Macbeth Corp.
Manning, Maxwell & Moore
Mine & Smelter Supply
Minneapolis-Honeywell
Moore Products
Norcross Corp.
Nuclear Research Corp.
Ohmart Corp.
Penn Insts. Div.
Phoenix Prec. Instr.
Prec. Thermom. & Insts.
Radioactive Prods., Inc.
Refinery Supply Co.
Republic Flow Meters
Roy Co., Milton
Shallcross Controls
Standard Instr. Co.
Taylor Instr. Cos.
Thermco Labs.
Wheelco Instr. Div.
Weston Electcl. Instr.

DEPTH, Liqiud, see Level

DEPTH INDICATORS, Navigational

Amer. Hydromath Corp
Bendix-Pacific
Bogue Electric Mfg.
Bristol Co.
Brush Electronics
Burton Mfg.
Colvin Labs.
Crosby Steam Gage
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King Engrg. Corp.
Liquidepth Indicators
Manning, Maxwell & Moore
Moeller Instr. Co.
Negus, T. S. & J. D.
Rahm Instr., Inc.
Raytheon Mfg. Co.
Servonic Insts., Inc.
Trimount Instr. Co.
Uehling Instr. Co.
U. S. Gauge Div.

DETECTOR CARS, For Testing Rails in Trace, see Flaw Detector Cars

DETECTORS, Alpha Ray, Beta Ray, Gamma Ray, etc., see Radioactivity Instruments

DETECTORS, Benzol, see Gas Analyzers

DETECTORS, Carbon Monoxide, see Gas Analyzers

DETECTORS, Combustible Gas, see Gas Analyzers

DETECTORS, Crystal, see Crystals

DETECTORS, Electrical Ground, see Ground Detectors

DETECTORS, Explosion, see Combustion Safeguards

DETECTORS, Fire, see Fire Detectors

DETECTORS, Flaw, see Flaw Detectors

DETECTORS, Gamma Ray, see Radioactivity

DETECTORS, Gas including Methane and Mine Gases, see Gas Analyzers

DETECTORS, Hazardous or Poisonous Gas, see Gas Analyzers

DETECTORS, Hydrogen Sulphide, see Gas Analyzers

DETECTORS, Infrared, see Infrared Detectors

DETECTORS, Leak, see Leak

DETECTORS, Lie see Polygraphs

DETECTORS, Mercury Vapor, see Gas Analyzers

DETECTORS, Metal, see Metal Detectors

DETECTORS, Methane, see Gas Analyzers

DETECTORS, Microwave, see Antennas, also Radiation Pickups

DETECTORS, Mine Gases, see Gas Analyzers

DETECTORS, Neutron, see Radioactivity

DETECTORS, Oxygen Deficiency, see Gas Analyzers

DETECTORS, Pin Hole, see Flaw Detectors

DETECTORS, Radiation or Radioactivity (Dosimeters), see Radioactivity

DETECTORS, Radium, see Radioactivity

DETECTORS, Sound, see Sound

DETECTORS, Vibration, see Vibration

DETECTORS, Voltage, see Null Detectors, also Voltmeters

DETONATION INDICATORS

Bendix, Eclipse-Pioneer
Bliley Electric
Century Geophysical
Electro Products Labs.
Engineering Res. & Devel.
Photocon Research
Rowe Engrg. Co.
Rutico, Inc.
Sperry Gyroscope
Topp Industries
Trimount Instr. Co.

DEW POINT INSTRUMENTS, see Humidity

DIAL FACES

Ackerman Engravers
Acromark Co.
Acton Labs.
Allegheny Plastics
Allied Engraving
Allied Products Div.
Amer. Emblem Co.
Amer. Laubscher
Amer. Name Pl. & Mfg.
Automation Equipt., Inc.
Anderson & Sons
Bache & Company, Semon
Bastian Bros.
Bodnar Industries
Borel & Co.
Burlington Instr.
Can. Rad. & Uran.
Carroll Co.
Chart Production Co.
Chicago Dial
Chicago Thrift Etching
Cleveland Metal Specs.
Conn-Craft Co.
Continental-Diamond Fibre
Corning Glass Works
Croname, Inc.
Crosby Steam Gage
Daven Company
Dearborn Glass Co.
Detroit Name Plate Co.
Dialight Corp.
Dietz Co.
Dura Plastics
Eastern Etching & Mfg.
Electro-Chemical Engrg. Co.
Electronics, Inc.
Elgin Natl. Watch
Etched Products Co.
Felsenthal & Sons
Formica Co.
Gadets, Inc.
Gallien, R. P.
GE, Chem. Dept.
GE, Instr. Dept.
Genl. Etch. & Mfg. Co.
General Radio Co.
Glass Products Co.
Gorton Machine Co.
Grammes & Sons
Grigoleit Co.
Gurley, W. & L. E.
Hamilton Watch
Helipot Div.
Hermes Engravers
Hurd, H. H.
Insuline Corp. of Amer.
Johnson Glass Co.
Lancaster Lens Co.
Manhattan Dial Mfg. Co.
Marsco Mfg. Co.
Marsh Corp., Jas. P.
Maryland Etching Co.
Mayer Co., Geo. J.
Maymer Corp.
Meriam Instr. Co.
Metalphoto Corp.
Mica Insulator
Miller Dial & Name Pl.
Modern Tech. Supply
Moss & Co.
Motson Co.
Natl. Time & Signal
New Haven Clock
Newmatic Corp.
O'Hara Waltham Mfg.
Palm Bros. Decal.
Parisian Novelty Co.
Park Nameplate Co.
Patterson Co., Wayne D.
Penn Optical & Instr.
Phaostron Co.
Photo Chemical Prods.
Photoplating Co.
PIC Design Corp.
Precise Measmts. Co.
Prec. Thermom. & Insts.
Printloid, Inc.
Rawson & Evans
Reeves Instr. Co
Regal Instr. Co
Renick Co.
Richardson Co.
Rohm & Haas
Sampson Chem. & Pigm.
Sandy Mfg. Co.
Scientific Instr. Co.
Signal Indicator Corp.
Sillcocks-Miller
Spencer Mfg. Co.
Swanson Engrg. Co.
Tablet & Ticket Co.
Techniques Inc.
Trans-Gel Products
U. S. Gauge Div.
U. S. Radium Corp.
Valley-National
Vallorbs Jewel Co.
Watertown Mfg.
Western Lithograph

DIAL LIGHTS, see Pilot Lights

DIAL MICROMETERS, see Dimensional Gages

DIAL THERMOMETERS, see Thermometers, Dial

DIALS, Multiple Revolving

Ackerman Engravers
Acromark Co.
Acton Labs.
Allied Engraving
Amerac, Inc.
Automatic Electric
Bodnar Industries
Borg Equipt. Div.
Carroll Co., J. B.
Chicago Thrift-Etching
Ford Engrg. Co.
Gurley, W. & L. E.
Helipot Div.
Johnson Co., E. F.
Millen Mfg. Co.
PIC Design Corp.
Rex Rheostat Co.
Sillcocks-Miller

DIALS and POINTERS, Fluorescent

Ackerman Engravers
Allied Engraving
Automation Equipt. Inc.
Borg Equipt. Div.
Can. Rad. & Uran.
Carrol Co.
Dale Products
Hamilton Watch
Johnson, E. R.
Link Aviation
Maryland Etching Co.
Maymer Corp.
Millen Mfg. Co.
Miller Dial & Name Pl.
Phaostron Co.
PIC Design Corp.
Precision Tube Co.
Scientific Instr. Co.
Superior Tube
U. S. Radium Corp.
Valley-National
Waldom Electronics

DIAMOND CONTACT POINTS, for Gaging

Continental Mach., Inc.
Crafts Co., Arthur A.
Dessau, Maurice S.
Gatti, Aurele M.
Industrial Abrasives
Keller & Co.
Powers, Geo.
Precision Diamond Tool
Swedish Gage
Waltham Precision Tool
Willey's Carbide Tool

DIAMOND HARDNESS, Penetrators, see Hardness

DIAMOND TOOLS, including Styli

Alfa Amer. Corp.
Allied Products Div.
Balloffet-Vianney
Bausch & Lomb
Bird & Co.
Crafts Co., Arthur A.
Dessau, Maurice S.
DoAll Co.
Duotone Co.
Edna Lite Co.
Engis Equipt. Co.
Ex-Cell-O Corp.
Ferner Co.
Fineisen, A. R.
Fish-Schurman
Gallien, P. R.
Gatti, Aurele M.
GE
Gorton Machine Co.
Greenlee Co.
Hamilton Watch
J & S Tool Co.
Jadow Inc.
Keller & Co.
Mico Instr. Co.
Modern Tech. Supply
Moser Jewel Co.
Powers, George
Prec. Diamond Tool Co.
Raybestos-Manhatten
Vallorbs Jewel Co.
Wall Colmonoy Co.
White Dental Mfg.
Willey's Carbide Tool

DIAMONDS, Industrial including Dust

Balloffet-Vianney
Crafts Co., Arthur A.
Dessau, Maurice S.
Elgin Natl. Watch
Engis Equipt. Co.
Ferner Co., R. Y.
Fish-Schurman
Gallien, R. P.
Gatti, Aurele M.
Greenlee Co.
Krengel, Maurice
Prec. Diamond Tool Co.
Rough Diamond Co.
Vallorbs Jewel Co.
Wall Colmonoy Co.
Whittaker, Clark & Daniels
Willey's Carbide Tool

DIAPHRAGM TESTING MACHINES

Dice Co.
Kahn & Co.
Krouse Testing Mach.

DIAPHRAGMS, Leather Fabric and/or Rubber

Acushnet Process Co.
Amer. Hard Rubber Co.
Amersil Co., Inc.
Armstrong Cork
Atlantic India Rubber
Auburn Mfg.
Bellofram Corp.
Blossom Mfg.
Bristol Co.
Chicago Rawhide Mfg.
Cooper Co., Clark
Daniels, Inc.
Detroit Gasket & Mfg.
Excelsior Leather Mfg.
Garlock Packing Co.
Genl. Tire
Goodrich Co., B. F.
Goodyear Tire
Graton & Knight
Hamilton Rubber Mfg.
Instruments Inc.
Kendall Controls
LeRoy Maugans Co.
Lord Mfg.
Mechanical Leather Co.
Mica Insulator
New York Rubber
Parker Stearns & Co.
Raybestos-Manhattan
Republic Rubber Div.
Resistoflex Corp.
Reynolds Gas Prods. Co.
U. S. Rubber
Westinghouse Air Brake Co.

DIAPHRAGMS, Metal

Aeromarine Inst. Co.
Amer. Silver Co.
Atlas Valve Co.
Baker & Co.
Bendix, Eclipse-Pioneer
Bendix Friez
Blossom Mfg.
Bristol Co.
Buhl Optical
Burton Mfg. Co.
Chicago Metal Hose
Colvin Labs., Inc.
Cook Electric Co.
Cooper Co., Clark
Edmund Scientific
Fulton-Sylphon Div.
General Plate Div.
Giannini & Co.
Hathaway Instr. Co.
Instruments, Inc.
Jordan Reg. Corp.
Keystone Carbon Co.
Kollsman Instr. Div.
Lackner Co.
Lewyt Corp.
Lynn, Robert M.
Mallory & Co., P. R.
Molded Insulation
New Eng. Steam Gauge Co.
Patterson Co., Wayne D.
Phosphor Bronze Smeltg.
Sherman & Co.
U. S. Gauge Div.
U. S. Indestruc. Gasket

DIELECTRIC MATERIALS

Acme Wire Co.
Aircraft-Marine Prod.
Amer Lava Corp.
Baird Assocs.-Atomic Instr.
Bakelite Div.
Brand & Co.
Carbide & Carbon
Centralab Div.
Cont.-Diamond Fibre

Crane Packing Co.
Crowley & Co.
Dow Chemical
Durez Plastics
Durlite Plastics
Emerson & Cuming
Erie Resistor
Fish-Schurman
Formica Co.
General Aniline & Film
General Chemical Div.
Genl. Ceram. & Steatite
GE
Insulation Mfrs. Corp.
Johnson Co., E. F.
Macallen Co.
Mica Insulator Co.
Minnesota Mining &Mfg.
Mitchell Rand Insul.
Mycalex Corp. of Amer.
Natl. Varnished Prods.
Precision Paper Tube Co.
Polymer Corp.
Printloid, Inc.
Radiation Res. Corp.
Resistoflex Corp.
Rex Corp.
Richardson Co.
Rohm & Haas
Slaughter Co.
Steatite Div.
Spaulding Fibre Co.
Stupakoff Div.
U. S. Gasket Co.
U. S. Rubber
Watertown Mfg.
Werner Co., Inc., R. D.
Wilmington Fibre
Zophar Mills, Inc.

DIELECTRIC PROPERTIES TESTERS

Antenna Research Lab.
Assoc. Research, Inc.
Aviation Engrg. Corp.
Boonton Radio
Central Res. Labs.
Comtor Co.
Custom Scientific Insts.
Davis Electric
Del Electronics
Doelcam Div.
Eberbach & Sons
Electronic Devel. Lab.
Erdco Engrg. Co.
Erie Resistor
Federal Prods. Corp.
Federal Telephone & Radio
Fielden Instr. Div.
GE, Apparatus Sales
General Instr. Co.
General Radio
Hallikainen Instruments
Hewson Co.
Industrial Test Equipt.
Instrument Labs.
Jarco Services, Inc.
Kahn & Co.
Leeds & Northrup
Lepel High Freq. Labs.
Magnaflux Corp.
Manson Labs.
Marconi Instruments
Martindale Electric
Peschel Electronics
Precise Measmts. Co.
Radiation Res. Corp.
Refrigeration Systems
Rieker Instr. Co.
Robertshaw-Fulton
Roller-Smith
Sargent & Co.
Seedburo Equipt. Co.
Sherron Metallic Corp.
Standard Electric
Sylvania Elect. Prods.
Testing Machines, Inc.
U. S. Testing Co.
Westinghouse Electric
Weston Electcl. Instr.
Winslow Co.
Yellow Springs Instr.

DIE-SETS, PRECISION

Jadow Inc.
Pratt & Whitney
Sylvania Elect. Prods.
Woodruff & Stokes

DIES, Diamond

Allied Products Div.
Balloffet-Vianney
Crafts Co., Arthur A.
Fineisen, A. R.
Gallien, R. P.
Jadow Inc.
Keller & Co.
North Amer. Philips

DIES, Metric

Balloffet-Vianney
Bayside Watch Tool Co.
Ferner Co.
Fineisen, A. R.
Gallien, R. P.
Hirschmann Co.
Jadow Inc.
Pratt & Whitney
Swiss Amer. Jewel Bear.

DIES, Sapphire, Wire Drawing

Balloffet-Vianney
Bird & Co.
Dessau, Maurice S.
Dixon, Inc.
Eastern Specialty Co.
Elgin Natl. Watch
Fineisen, A. R.
Gallien, R. P.
Gatti, Aurele M.
Industrial Jewel Bearing
Keller & Co., L. H.
Powers, George
Vallorbs Jewel Co.
Warebro Jewel Co.
Worley Jewel Co.

DIFFERENTIAL PRESSURE, see Pressure Differential

DIFFERENTIAL TRANSFORMERS, see Displacement Pickups, Differential Transformer

DIFFRACTION GRATING, see Grating, Diffraction

DIGITAL READOUT INDICATORS (see also Data Processing)

Aero Electronics
Amer. Mach. & Foundry, Electronics Div.
Anatran Engrg. Corp.
Anelex Corp.
Assembly Products
Austin Company
Bendix-Pacific
Berkeley Div.
Borg Equipt. Div.
Brush Electronics
Commercial Controls Corp.
Commercial Res. Div.
Computer-Measmts. Corp.
Detectron
Electro Instruments
Electro-Pulse, Inc.
Electronic Control Systems
Epsco, Inc.
Farrand Optical
Fischer & Porter Co.
Franklin Electronics
Geotechnical Corp.
Gilmore Industries
Hanson-Gorrill-Brian
Hupp Instrumentation
Hycon Electronics
I-L-S Instr. Corp.
Ill. Testing Labs.
Industrial Control Co.
Indust. Electronics Engrs.
Kleinschmidt, Inc.
Metrotype Corp.
Moseley Co.
North Amer. Philips
Panellit, Inc.
Potter Instr. Co.
Probescope Co.
Radiation Instr. Dev. Lab.
Rutherford Electronics
Special Instruments Lab.
Taller & Cooper
Telecomputing Corp.
Ultrasonic Corp.
Wang Labs.
Weston Electcl. Instr.
Westronics, Inc.

DIGITAL RECORDERS, see Printers

DIGITALIZERS, see Converters, Analog-to-Digital

DILATOMETERS

Ace Glass
Amer. Instr. Co.
Bristol Co.
Can. Rad. & Uran.
Dietert Co.
Ferner Co.
Gaertner Scientific
Gilmore Industries
Industrial Electronics
Instrument Devel. Labs.
Jarrell-Ash
Leeds & Northrup
Leitz, Inc.
Martin & Co.
Maveg Mach. Sales
Olsen Testing Machine
Rockwell Co., Stanley P.
Scientific Glass App.
Sylvania Elect. Labs.
Zeiss, Inc., Carl

DIMENSIONAL GAGES, Electronic, including Comparators, Micrometers (see also Thickness Gages)

Aero Electronics
Arizona Tool & Die Co.
Arlin Products
Assoc. Research, Inc.
Autom. Temp. Contr. Co.
Boonton Radio
Branson Instruments
Bristol Co.
Brown & Sharpe
Brush Electronics
Cleveland Instr. Co.
Colvin Labs.
Control Components Co.
Daytronic Corp.
Decker Aviation Corp.
Dice Co.
DoAll Co.
Donner Scientific
Electric Eye Equipt.
Electro Products Labs.
Electronic Controls, Inc.
Electronic Control Systems
Federal Prods. Co.
General Electronic
Hastings-Raydist
Hathaway Instr. Co.
Hickok Electcl. Instr.
Indikon Co.
Industrial Electronics
Indust. Gauges Corp.
Indust. Nucleonics Corp.
Instr. Devel. & Mfg. Corp.
Kahn & Co.
Lear, Inc.
Nuclear Research Corp.
Panoramic Radio Co.
Phaostron Co.
Photoswitch, Inc.
Poole Instruments
Portman Instr. Co.
Pratt & Whitney
Robertshaw-Fulton
Rockwell Engrg. Co.
Schaevitz Engineering
Sensitive Res. Instr.
Sheffield Corp.
Sherron Metallic
Size Control Co.
Standard Electric
Std. Electronic Res.
Stevens-Arnold
Swedish Gage
Testing Machines, Inc.
Van Keuren Co.
Wilmotte, Inc.

DIMENSIONAL GAGES, Mechanical, including Adjustable Length, Bore, Caliper, Center, Coating Thickness, Concentricity, Cylinder, Dial, Drill Grinding, End Measure, Foot Blocks, Gage Blocks, Height, Linear Depth, Micrometer, Pipe, Piston Ring, Pitch Diameter, Plug, Profile, Radius, Taper, Thickness, etc. (see also Thickness)

ACF Electronics
Ace Glass
Acme Industrial
Acme Scientific
Adde & Co.
Aero Electronics
Aeromarine Instr. Co.
Airborne Instruments
Alina Corp.
Allen Gauge & Tool
Amer. Gage Co.
Amer. Instr. Co.
Amer. Measuring Insts.
Amer. Meter Co.
Amer. Tradair Corp.
Ames Co.
Amthor Testing Instr.
Ann Arbor Instr. Wks.
Anton Electronic Labs
Applied Research Labs.
Arizona Tool & Die Co.
Arlin Products
Arma Corp.
Ashton Valve Co.
Authorized Mfrs. Service
Autom. Temp. Contr. Co.
Autotron Co.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bausch & Lomb
Berkshire Labs.
Bethlehem Apparatus
Branson Instruments
Bristol Co.
Brown & Sharpe
Brush Electronics
Bryant Chucking Grinder
Buffalo Scale Co.
Builders-Providence
Bush Associates
Cadillac Gage Co.
Cody & Co.
Can. Rad. & Uran.
Carson Micrometer
Central Scientific
Chatillon & Sons
Chicago Dial Ind. Co.
Circle Gage Co.
Cleveland Instr. Co.
Commercial Res. Div.
Computer Instr. Co.
Comtor Co.
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Gem Instrument
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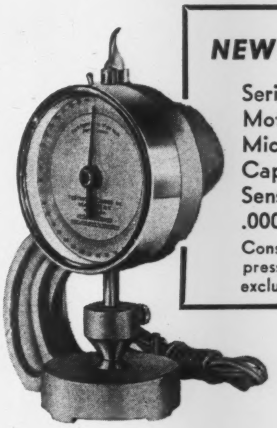

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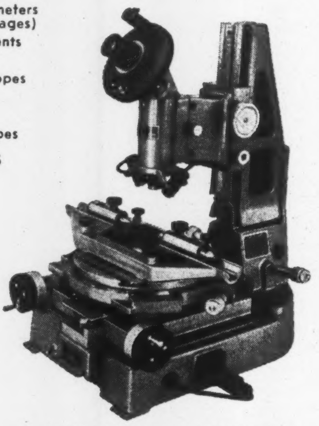

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Nuclear Research
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United Engineers
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Victor Laboratory
Viking Instruments
Vinco Corp.
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Warren-Knight
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Wilmotte, Inc.
Woodworth Co.
Worley Jewel Co.
Zeiss, Inc., Carl

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Acme Scientific
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Amer. Meas. Instr.
Amer. Optical
Ann Arbor Instr. Works
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Askania Reg. Co.
Askania-Werke A. C.
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Baird Assocs.-Atomic Instr.
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Bronoptics Co.
Brown & Sharpe
Brush Electronics
Cambridge Instr. Co.
Carroll Co.
Clark & Sons
Coleman Engrg. Co.
Compar Instr. Co.
Cal-Astro Optical Labs.
Cambridge Thermionic
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Davidson Mfg.
Dixon Inc.
DoAll Co.
E & S Optical
E & W Optical
Eder Instr. Co.
Edmund Scientific
Electro-Mec Lab.
Electronic Res. Labs.
Electronic Spec. Co.
Engineers Specialty Div.
Engis Euipt. Co.
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Farnsworth Electronics
Farrand Optical
Fecker, Inc.
Federal Prods. Corp.
Ferner Co.
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Gaertner Scientific
Gordon Enterprises
Graf-Apsco
Griswold Mfg. Co.
Gurley, W. & L. E.
Hacker & Co.
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Henson Co.
Hillyer Instr. Co.
Hirschmann Co.
Hyde Instr. Co.
Instrument Devel. Labs.
Jarrell-Ash
Jones & Lamson Mach.
Keuffel & Esser
Lab. Optical
Leitz Inc.
Link Aviation
Mann Co., W. I.
Mason Instr. Co.
Menlo Research Lab.
McPherson Prec. Insts.
Meyer-Opticraft
Natl. Instr. Co.
Natl. Tool Co.
Opplem Co., Inc.
Optical Development Corp
Optical Gaging Prods.
Optron Lab.
Palos Optical
Pan-technics, Ltd.
Penn Optical & Instr.
Perkin-Elmer
Phoenix Prec. Instr.
Photogrametry, Inc.
Polarizing Instr. Co.
Portman Instr. Co.
Pratt & Whitney
Precision Scientific
Rudolph & Sons
Ruska Instr. Corp.
Scherr Optical Tools
Schneider-Cogswell
Sheffield Corp.
Std. Electronic Res.
Stocker & Yale
Swedish Gage
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Testing Machines, Inc.
Tinsley Labs.
Unertl Optical
Van Keuren Co.
Wild Heerbrugg
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Zeiss, Inc., Carl

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Gaertner Scientific
Moore Products
Pratt & Whitney
Sheffield Corp.

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Taft-Peirce

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Kay Electric
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Reiner Electronics
Scientific Specialties
Tare Electronics
Teletronics Lab., Inc.
Waters Mfg.
Westronics, Inc.

DIODES, Germanium

Amperex Electronic
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Bendix Aviation Corp.
Berkshire Labs.
Bogue Electric Mfg.
CBS-Hytron Div.
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Engineered Electronics
GE, Electronics Div.
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Raytheon Tube Div.
Scientific Specialties
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Transitron Electronic
Tung-Sol Electric

DIODES, Silicon

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Bogue Electric Mfg.
Bomac Labs.
CBS-Hytron Div.
Centralab Div.
GE Electronics Div.
Hughes Prods. Div.
Hydro-Aire
Industro, Inc.
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Lectronic Research
Microwave Assocs.
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Pac. Semiconductors
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Radio Receptor
Raytheon Tube Div.
Sylvania Elect. Prods.
Texas Insts. Inc.
Transitron Electronic
Tung-Sol Electric

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Bendix Aviation Corp.
Engrg. & Res. Corp.
Kearfott Co.
Lear, Inc.

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Airborne Instruments
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Allis-Chalmers
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Annis Co.
Arma Corp.
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Barber-Colman
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Dickson Co.
Doelcam Div.
Donner Scientific
Edcliff Instruments
Electric Indicator Corp.
Electric Speed Ind. Co.
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Electro Products Labs.
Electronic Assoc.
Endevco Corp.
Engineering & Res. Corp
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Fielden Instr. Div.
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Hays Corp.
Henschel Corp.
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Larson Instr. Co.
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Photocon Research
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Schaevitz Engineering
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Servomechanisms, Inc.
Servo Tek Products
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Vibr. Measmt. Engrs.
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Weighing Components
Weston Electrical Instr.
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Bristol Co.
Colvin Labs.,
Crescent Engr. & Res. Co.
Elect. Tachometer Corp.
Electro Products
Fielden Instr. Div.
Henschel Corp.
Industrial Electronics
Orban Co., Kurt
Potter Instr. Co.
Wang Labs., Inc.

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Fielden Inst. Div.
Medical Electronics Dev.
Minatron Corp.
Sheffield Corp.
Statham Laboratories
Ultradyne Engrg. Labs.
Wiancko Engrg. Co.

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Daystrom-Pacific
Daytronic Corp.
Fielden Instr. Div.
Gyroscopics, Inc.
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Magnetic Instr. Co.
Minatron Corp.

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Altec Lansing
American Gryo Corp.
Control Components Co.
Consol. Electrodynamics
Crescent Engrg. & Res. Co.
Daystrom-Pacific
Electro Products Labs.
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Gyroscopics, Inc.
Internat. Res. & Devel.
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Magnovox Co.
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Potter Instr. Co.
Wiancko Engrg Co.

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Bourns Labs.
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Daystrom-Pacific
Dynamic Instrument
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Electro-Mec Lab.
Electro Mechanical Div.
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Lab-Tronics
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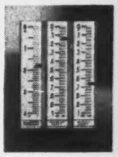

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Ferner Co.
Gaertner Scientific
Griswold Mfg. Co.
Gurley, W. & L. E.
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Vinco Corp.
Webber Gage Co.
Zeiss, Inc., Carl

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DOSIMETERS, see Radioactivity

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Hagan Corp.
Hammel-Dahl
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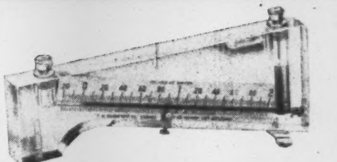

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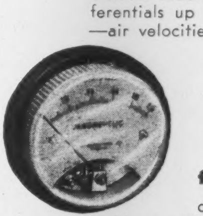

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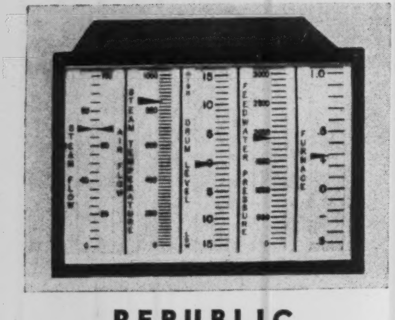

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Schade Valve Mfg.
Seely Instr. Co.
Shallcross Controls
Soreng Products
Taylor Instr. Cos.
Uehling Instr. Co.
Weston Electcl. Instr.

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Alpha Instr. Co.
Alteneder & Sons, Theo
Amer. Hydromath Corp.
Berger & Sons
Brown & Sharpe
Bruning Co., Inc.
Brush Eectronics
Charvoz-Roos
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Drafto Co.
Gerber Scientific
Graf-Apsco
Gurley, W. & L. E.
Ithaca Scient. Instr.
Joyro Assocs.
Keuffel & Esser
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Micro Master Co.
Millers Falls Co.
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Opplem Co.,
Post Co., Frederick
Precise Measmts. Co.
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Reed Research
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Suverkop Instruments
United States Blue Print
Univ. Drafting Mach.
V. & E. Mfg.
Warren-Knight
Weber Co., F.
White Co.
Wild-Heerbrugg
Williams, Brown & Earle

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Carroll Co., J. B.
Curtiss Labs. Inc.
Driftmeters, Inc.
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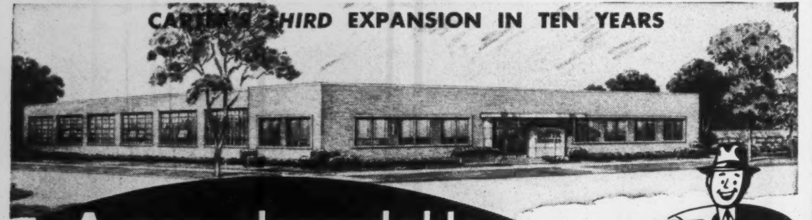
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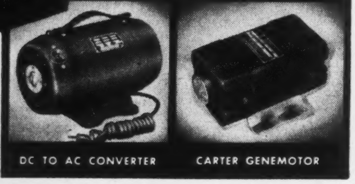

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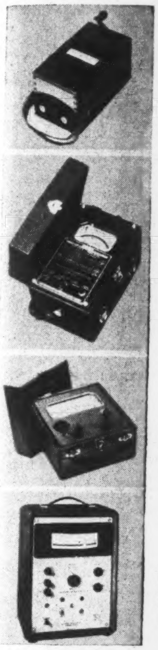

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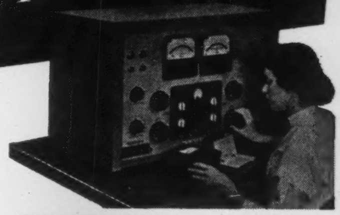

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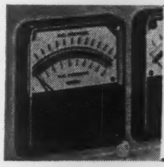

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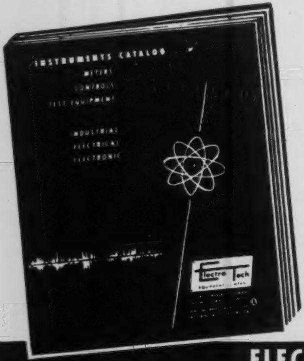

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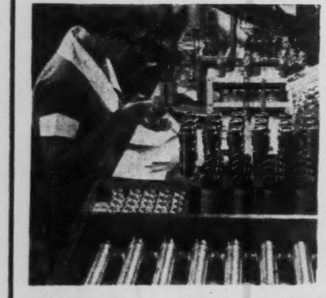

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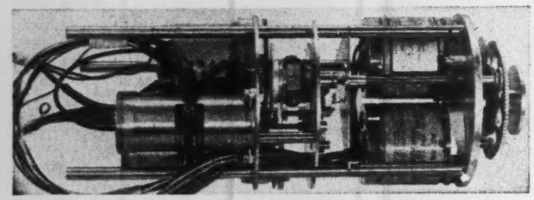

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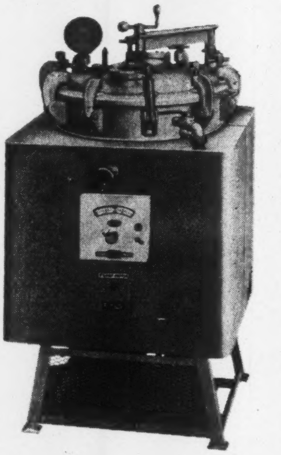

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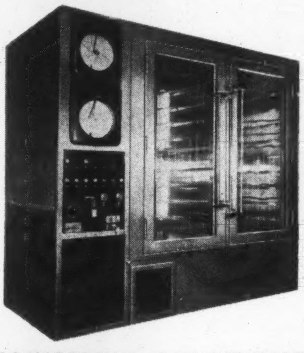

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Research and Development Laboratories are demanding greater accuracy of simulated atmospheric conditions. It is therefore necessary that special application be made of the known techniques of creating temperature, humidity, etc. so as to produce such conditions in various types of housings and enclosures

On many occasions there is no standard apparatus on the market that can be purchased for the special conditions required. For any one company to put in the necessary tools for the manufacture of special complete apparatus would make the selling price prohibitively high in most cases.

To overcome this price disadvantage on equipment designed to meet the special specifications of today's and tomorrow's testing demands, arrangements can be made for one of our Design Engineers to create the necessary designs. The actual construction and assembly are under our supervision and fabricated according to our specifications.

This work falls under the category of "Engineering Consultation". Send us your inquiries covering your immediate needs so that we may be in a position to serve you at the earliest possible moment.

Department A-1-56

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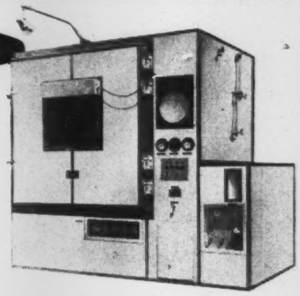

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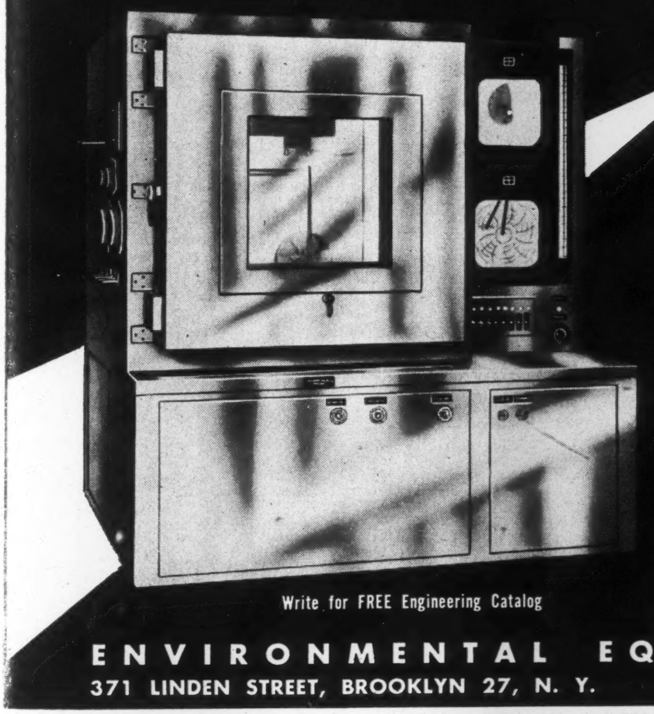

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- **TEMPERATURE** — 150°F to 500°F
- **HUMIDITY** (RH) 20% to 95%
- **ALTITUDE** up to 150,000 feet
- **TEST SPACE** 1 cu. ft. to Walk-In Rooms

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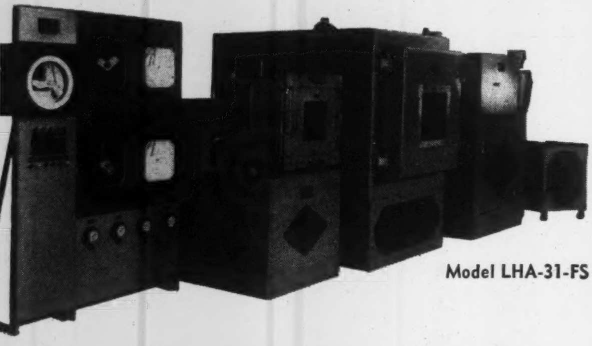
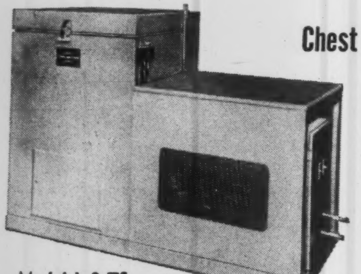


Model LHA-31-FS

High-Low Temperature Chamber with Portable Altitude Testing Section

Full program control on both temperature and altitude. The 8 cu. ft. altitude test unit is used for ambient altitude testing and can be inserted in the 31 cu. ft. temperature test chamber for low temperature altitude testing. Designed for —100° F. with rapid temperature reduction and close temperature control. Altitude simulation is provided to 200,000 feet with controlled climb and dive. Humidity is controlled from 35° to 175° F., 20% to 95% r.h.



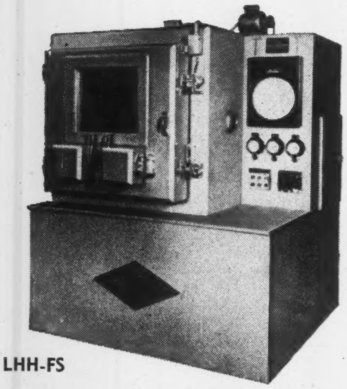
Model L-3-TS

Chest Type Low-Temperature Cabinet

Available in sizes from 2 to 30 cu. ft. net working space. Optional controls furnished to customer specifications. Temperature range to —100° F. Capacity for rapid temperature reduction.

Low-High Temperature Chamber with Controlled Humidity

Supplied in sizes from 2 to 100 cu. ft. net working space, these chambers operate to —100° F at rapid reduction rate and provide controlled humidity through a range of 35 to 175° F at 20 to 95% r.h. Full controls available.



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Equipment available to meet U. S. Govt. specs for environmental testing. Electronic or pneumatic recording or indicating control systems. Walk-in rooms, temperature baths and custom chambers manufactured to specifications. Optional finishes in hammertone, aluminum or stainless steel. Rounded corners standard on all equipment.

Manufacturers of Environmental Test Equipment Since 1941

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ENCAPSULATING MATERIALS, see Potting Compounds

ENCLOSURES, see Panels, also Cabinets

END MEASURES, see Dimensional Gages

ENGINE COMPRESSION INDICATORS, see Engine Test Instruments

ENGINE GOVERNORS, including Internal Combustion Engines, Steam Turbines, etc.

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Douglass Autom. Controls
Farris Pickering Governor
Fisher Governor
Flight Res., Inc.
General Controls
GE
Hagan Corp.
Humphrey, Inc.
Inet Div.
Leslie Co.
Mason-Neilan Div.
Stratos Div.
Synchro-Start Products
Taylor Instr. Cos.
Worthington Corp.

ENGINE INDICATORS, see Engine Test Instruments

ENGINE TEST INSTRUMENTS, including Ignition Analyzers, Compression Indicators, etc.

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Advanced Electronics Inc.
Aero Electronics
Aeromarine Instr. Co.
Airdraulics Engrg. Inc.
Amer. Instr. Co.
Ann Arbor Instr. Works
Autom. Temp. Contr. Co.
Bacharach Industrial Instr.
Baldwin-Lima-Hamilton
Barbour Stockwell
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Berkeley Div.
Bogue Electric Mfg.
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Control Engrg. Co.
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Daytronic Corp.
Dillon & Co.
Dumont Labs., Allen B.
Edison Inc., Thomas A.
Eitzen Co., L. C.
Electric Auto-Lite
Electric Heat Control
Electric Tachom. Co.
Electro Products Labs.
Electronic Spec. Co.
Engelhard Inc., Chas.
Engineering Res. & Dev.
Engler Instr. Co.
Federal Telegraph & Radio
Fox Valley Instr.
Gadgets, Inc.
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GE, Instr. Dept.
General Electronic
General Instr. Co.
Gilmore Industries
Gow-Mac Instr. Co.
Hathaway Instr. Co.
Hays Corp.
Hickok Electcl. Instr. Co.
I-L-S Instr. Corp.
Illinois Testing Labs.
Industrial Engrg. Corp.
Instrument Lab, Inc.
Internat. Std. Trading
Kahn & Co.
Kimble Glass
Kistler Instr. Co.
Kollsman Instr. Co.
Lab-Tronics
Land-Air Inc.
Lewis Engrg. Co.
Marion Electcl. Instr.
Marsh Corp.
Nankervis Co., George L.
Nuclear Research
Olsen Testing Machine
Photocon Research
Potter Co.
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Precision Scientific
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Westburg Mfg. Co.
Weston Electcl. Instr.
Wiancko Engrg. Co.

ENGRAVING EQUIPMENT, including Metal and Plastic, see Machines, Engraving

ENGRAVING OF GLASS, see Machines, Engraving

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Amer. Instr. Co.
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When Using This Guide look under the variable, e.g., Pressure Gages (not Gages, Pressure); or look under the noun—Magnets, Permanent (not Permanent Magnets).

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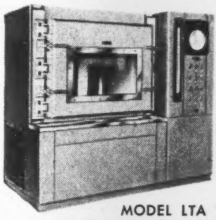
Advanced design features, highest quality materials and superior craftsmanship go into every M & M test unit to assure accurate tests and dependable operation. Before you specify or buy *any* test equipment – see what Murphy & Miller has to offer you.



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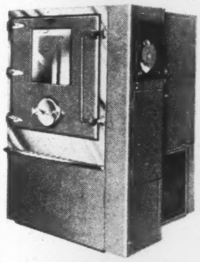
12 CUBIC FT. TEST SPACE

ALTITUDE SIMULATION UNIT

- **Altitude Ranges over 200,000 ft.**
- **Temperature Range from +1200°F to −120°F**
- **Humidity cycle 20% to 95% from +35°F to 185°F**
- **New design—greater capacity per horsepower—lower operating cost . . . greater efficiency**

Available in units with 12 to 64 cubic ft. of test space, M & M Altitude Simulation Chambers offer every standard and optional feature for faster, more flexible testing. Optional features include Program Controlled Heating, Cooling and Humidity Cycles, Automatic Recorders, Special Wiring, etc. etc.



MODEL H 12
12 CUBIC FT.
TEST SPACE

HUMIDITY TEST CABINET

- **Provides Relative Humidities between 20% and 95%**
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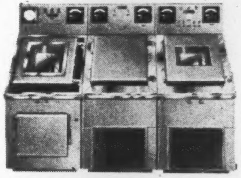

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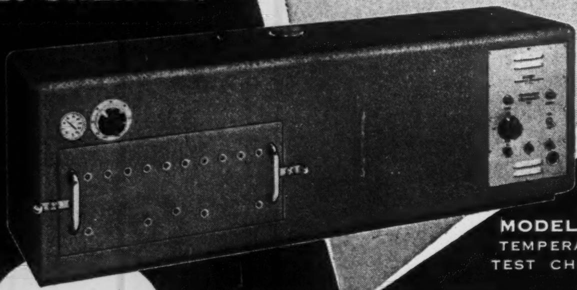

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TEMPERATURE TEST CHAMBER

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Victory Engrg. Corp.
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Yellow Springs Instr. Co.
York Ice Machinery Corp.

EPUT METERS, see Timers, Microsecond; also Counters, Electronic

ETCHERS, Electric Arc

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Annis Co., R. B.
Bausch & Lomb
Behm & Sons
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Crown Indust. Prods. Co.
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Edna Lite Co.
Eisele & Co.
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Heise Bourdon Tube
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EXPOSURE METERS, see Illumination

EXTENSOMETERS

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Cambridge Instr. Co.
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Daytronic Corp.
Eitzen Co.
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Research Appliance Co.
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Schaevitz Engineering
Statham Labs.
Swedish Gage
Testing Machines, Inc.

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Polarizing Instr. Co.
Schneider-Cogswell
Zeiss, Inc., Carl

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U. S. Testing Co.
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Rubicon Co.
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Sierra Electronic
Technical Insts. Co.
Teletronics Lab.
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Tobe Deutschmann Corp.
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Westinghouse Electric

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Industrial Insts., Inc.
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Felt Prods. Mfg. Co.
Gallien, R. P.
Grobet File
Inlaid Optical Corp.
Marston Co.
Rhodes & Co., James H.

FIELD RHEOSTATS, see Rheostats, Field

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Empire Devices, Inc.
Federal Telephone & Radio
Ferris Instr. Co.
GE
Georator Corp.
Kahn & Co.
Kearfott Co.
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FILLING MACHINES, see Machines, Filling

FILLING MEDIA for Thermometers

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Transmag Div.
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United States Electronics
United Transf. Corp.
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FILTERS, Crystal

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Unertl Optical
Valpey Crystals
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FILTERS, Electrical Wave, see Filters, Frequency

FILTERS, Frequency

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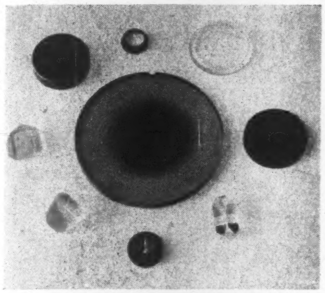
Pacific Div.
Pacific Instr. Co.
Philbrick Researches
Polyphase Instr. Co.
Radex Corp.
Ramapo Mfg. Co.
Raytheon Mfg. Co.
Sangamo Electric
San Fernando Electric
Scientific Specialties
Scott, Inc., Hermon Hosmer
Sherron Metallic Corp.
Shielding, Inc.
Southw. Indust. Electron.
Specialties, Inc.
Spencer-Kennedy Labs.

HIGH VACUUM COATINGS
of all types



- Anti-reflection "Lenscote"
- Density Filters
- Coatings to increase the transmission of infrared transmitting glass
- Aluminum and chromium front surface mirrors

also
METALLIC COATINGS FOR ELECTRONIC COMPONENTS

METAVAC • INC
45-68 162nd St., Flushing, N. Y.
Flushing 9-8838

For more information circle **134** on inquiry card.

Sprague Electric
Std. Electronic Res.
Std. Transf. Corp.
Superex Electronics Corp.
Telechrome, Inc.
Televiso Corp.
Texas Insts., Inc.
Thermador Elect. Mfg.
Thordarson-Meissner
Tobe Deutschmann
Torwico Electronics
Transformer Engrs.
Triad Transf. Corp.
United Transf. Corp.
Varo Mfg. Co.
Vectron, Inc.
White Instr. Labs.
Wilmar Mfg.

FILTERS, Light and Optical

Aerovox Corp.
Alfa Amer. Corp.
Amer. Instr. Co.
Amer. Optical
Baird Assocs.-Atomic Instr.
Bausch & Lomb
Behm & Sons
Bell & Howell
Binswanger & Co.
Boehmke Optical
Bolsey Corp.
Bray Optical
Bronoptics Co.
Buhl Optical
Cast Optics Corp.
Central Scientific
Corning Glass Works
Crystal Research Labs.
Curtiss Labs. Inc.
Dearborn Scientific
Dome Precision Corp.
DuMont Labs., Allen B.
E & S Optical
Eastman Kodak
Edmund Scientific
Edna Lite Co.
Electro-Physics
Empire State Labs.
Enteco Industries
Esco Prods. Co.
Evap. Metal Films, Inc.
Farrand Optical
Fecker, Inc.
Ferner Co.
Fish-Schurman
Fosdick Glass Co.
Gaertner Scientific
Gates & Co.
GE, X-Ray Corp.
General Radio
General Scientific
Geophysical Instr. Div.
Georator Corp.
Goerz Amer. Optical
Gordon Enterprises
Harrison & Harrison
Hayward Scient. Glass
Helio Instr. Co.
Henson Co.
Herron Optical
Jaegers, A.
Jan Hardware Mfg.
Jarrell-Ash
Jones Optical
Keim Prec. Mirrors
Klett Mfg.
Kollmorgen Optical
Lab. Optical
Lancaster Lens Co.
Leitz, Inc.
Leroy Clausing Co.
Lynn, Robert M.
Mann Co., Wm. I.
Master Optical
Merry Instr. Co.
Metavac, Inc.
Meyer-Opticraft
Mico Instr. Co.
Micramold Insulator
Miller Instruments
Optical Coating Lab.
Optical Engrg. Lab.
Optical Film Engrg. Co.
Pacific Optical
Pacific Univ. Prods. Corp.
Palos Optical
Pan-technics, Ltd.
Pancro Mirrors, Inc.
Perkin-Elmer
Pfaltz & Bauer
Phoenix Prec. Instr.
Photo Res. Corp.
Photovolt Corp.
Polaroid Corp.
Practo Photo Access.
Precise Measurements Co.
Prec. Glass Prods. Co.
Precision Prods.
Pyrometer Instr. Co.
Regal Instr. Corp.
Republic Lens Co.
Rubicon Co.
Rudolph & Sons
Schneider-Cogswell
Schutte Optical
Servo Corp. of Amer.
Simpson Optical Mfg.
Testrite Instr. Co.
Tinsley Labs.
Triumph Mfg. Co.
Ultra-Violet Prods., Inc.
Unertl Optical
Univis Lens Co.
Wollensak Optical
Zeiss, Inc., Carl
Zenith Optical Lab.

FILTERS, Porous Metal

Accessory Prods. Corp.
Autoclave Engrs.
Gar Prec. Parts, Inc.
High Pressure Equipt. Co.
Industrol Corp.
International Powder
Kaye & MacDonald
Lennard Co., P. M.
Micro Metallic Corp.
Moraine Products Div.
Norgren Co., C. A.
Pressure Prods. Industries
Schrader's Son, A.
Watts Regulator Co.

FILTERS, Radio Noise, see Filters, Frequency

FILTERS, WATER

A-P Controls Corp.
Accessory Prods. Corp.
Adams Co.
B-I-F Industries
Bogue Elect. Mfg.
Crystal Research Labs.
Daigger & Co.
Dollinger Corp.
Fisher Scientific
Infilco
Marvel Engrg. Co.
Micro Metallic Corp.
Penfield Mfg. Co.
Permutit Co.
Robbins Aviation

FILTERS, Wire Cloth

A-P Controls Corp.
Accessory Prods. Corp.
Air-Maze Corp.
Bishop Co.
Dollinger Corp.
Michigan Wire Cloth Co.
Micro Metallic Corp.
Multi Metal Wire Cloth
Lennard Co., P. M.
Newark Wire Cloth Co.
Norgren Co.
Pressure Prods. Industries
Research Appliance Co.
Roebling's Sons

FIRE CONTROL INSTRUMENTS, Military and Naval Ordnance

Abrams Instr. Corp.
Aero Electronics
Airborne Instr. Lab.
AiResearch Mfg.
Allegany Instr. Co.
Amer. Electronic Mfg.
Amer. Hydromath
Amer. Optical
Analogue Controls, Inc.
Arma Div.
Austin Co.
Autonetics Div.
Avion Div.
Bausch & Lomb
Bell & Howell
Bellock Instr. Co.
Bendix Aviation Corp.
Betts & Betts
Bronoptics Co.
Buhl Optical
Bunnell Co.,
Cal-Tronics Corp.
Cooper Co., Clark
Daco Mach & Tool Co.
Daystrom Instrument
Edcliff Instruments
Elect. Indicator Co.
Electro-Snap Switch
Electronic Associates
Electronic Spec. Co.
Farnsworth Electronics
Farrand Optical
Fecker, Inc.
Ford Instr. Co.
Gaertner Scientific
Garlynn Engrg. Co.
GE, Apparatus Sales
Giannini & Co.
Gilbert & Barker
Goodyear Aircraft
Gordon Enterprises
Gurley, W. & L. E.
H-B Instrument
Helio Instr. Co.
Ideal-Aerosmith
Industrial Control Co.
Instr. Devel. Lab.
Jacobs Instr. Co.
Jerpbak-Bayless
Kollmorgan Optical
Librascope, Inc.
Magnetic Industries
Mahn Co., W. I.
Martin-Hubbard
Maxson Corp.
Meyer-Opticraft
Mid-Century Instrumatic
Moog Valve
Nalley Co.
Norden-Ketay
North American Insts,
Opplem Co.
Perkin-Elmer
Phila. Scientific Glass
QOS Corp.
RCA Div.
Ram Meter, Inc.
Ramo-Wooldridge
Reeves Instr. Corp.
Schneider-Cogswell
Servomechanisms, Inc.
Servo-Tek Products
Simmonds Aerocessories
Sperry Gyroscope
Stavid Engineering, Inc.
Sterling Precision Insts.
Summers Gyroscope
Taller & Cooper
Unertl Optical
Vectron, Inc.
WacLine, Inc.
Wiancko Engrg. Co.
Wollensak Optical
Zoomer Corp.

FIRE DETECTORS (see also Combustion Safeguards)

Amer. Mach. & Foundry
Arnoux Corp.
Assembly Products
Brit. Electronic Sales
Control Products, Inc.
Cooper Co., Clark
De-Tec-Tronic Corp.
Diatron Co.
Edison, Inc., Thos. A.
Electronic Control
Electronic Spec. Co.
Electronics Corp. of Amer.
Fenwal, Inc.
G-V Controls
Internat. Std. Trading
Land-Air, Inc.
McNeill Engrg. Co.
Perfex Controls
Rheem Mfg. Co.
Rockwood Sprinkler
Sciaco Controls
Servo Corp. of Amer.
Simmonds Aerocessories
Std. Elect. Time Co.
Tell-Tronics Prods.
Uniform Tubes, Inc.
Worner Electronic Devices

FIREFINDERS, Forest Service

Leopold & Stevens
Zoomar Corp.

FIRING DISCS

Engrg. & Res. Corp.

FITTINGS, Tube and Pipe, Aluminum

Century Controls Corp.
Conduflex Corp.
Hetherington & Berner
Imperial Brass
Jordan Reg. Corp.
Natl. Automatic Prods. Co.
Scovil Mfg. Co.
Uehling Instr. Co.
Unistrut Prods. Co.
Weatherhead Co.

FITTINGS, Tube and Pipe, Brass and Copper

Aeroquip Corp.
Allmetal Screw Prods.
Bastion-Blessing
Breeze Corp.
Brockway Corp.
Century Controls Corp.
Chase Brass & Copper
Conant Bros. Co.
Conduflex Corp.
Crawford Fitting Co.
Diamond Instr. Co.
Dole Valve Co.
Grammes & Sons
Hartford Machine Screw
Hays Mfg. Co.
Hubbell Metals
Imperial Brass
Insuline Corp. of Amer.
Jordan Reg. Corp.
Parker Appliance Co.
Scovill Mfg. Co.
Seamlex Co.
Steel Co., Herman D.
Swissomatic Products
Uehling Instr. Co.
Unistrut Prods. Co.
Vallorbs Jewel Co.
Weatherhead Co.
Westinghouse Air Brake Co.

FITTINGS, Jacketed

Conduflux Corp.
Hetherington & Berner
Jerguson Gage & Valve
Littleford Bros.
Parker Appliance Co.
Parks-Cramer Co.

FITTINGS, High Pressure

Amer. Instr. Co.
Autoclave Engrs.
Bastian-Blessing
Conduflex Corp.
Crawford Fitting Co.
High Pressure Equipt. Co.
Imperial Brass
Natl. Automatic Prod. Co.
Parker Appliance
Pressure Prods. Industries
Research Appliance Co.
Ruska Instr. Corp.
Special Screw Prods. Co.

FITTINGS, Pipe, Hard Rubber

Conduflex Corp.
Cooper Alloy Foundry
Goodrich Co., B. F.
Luzerne Rubber
Raybestos-Manhattan
Stokes Molded Prods.
U. S. Rubber Co.
Vallorbs Jewel Co.
Vanton Pump & Equipt.

FITTINGS, Quick-Disconnect

Coaxial Connector Co.
Conduflex Corp.
Hansen Mfg. Co.
Hydromatics Inc.
Jordan Reg. Corp.
Schrader's Son, A.
Simmonds Aerocessories
Snap-Tite, Inc.
Vanton Pump & Equipt.
Weatherhead Co.

FITTINGS, Stainless Steel

Autoclave Engrs.
Century Controls Corp.
Conant Bros. Co.
Conduflex Corp.
Dragon Engrg. Co.
Hetherington & Berner
High Pressure Equipt. Co.
Imperial Brass

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Need Adjustable-Constant Flow Rates?

DON'T Build a System...

Install a

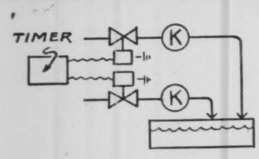
Kates*

* KATES Direct-Acting Flow Rate Regulators are complete in themselves, requiring no outside connections except inlet-outlet piping; for light slurries, clear liquids, and many suspensions; hold constant flow despite 125-psi jumps or drops in inlet-to-outlet pressure.

Economy may not be your principal reason for selecting a Kates regulator, but added to the single-unit compactness and no-hunt, no-lag features it is certainly a valued extra. And you will save on maintenance, too. Kates regulators are designed to eliminate wire-drawing, and the only packing is on the infrequently-used dial stem.

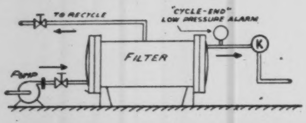
Write us for more details on the unique operating principles and practical design features of Kates flow rate regulators. But first, here are some of the problems that Kates has solved for others—*economically*.

BATCH PROCESS MEASUREMENT



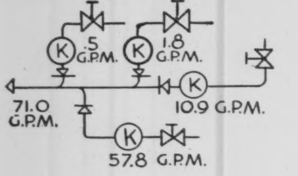
Automatic batch processes are easy when liquid ingredients are fed through Kates regulators and timer-operated solenoid valves. One timer can control all additives since individual flow *rates* can be set at each regulator. And it is easy to change proportions; just change the regulator settings.

PRESSURE FILTRATION CONTROL



As filter cake builds up, a constant valve-jockeying is needed to smooth out flow. A Kates control in the effluent compensates for rising pressure drop, keeps filter at best rating.

PROPORTIONATE BLENDING CONTROL



Where many ingredients go into one blend, and must be in exact proportion, a control *system* for each ingredient would cost plenty. But a Kates control on each feed does the job inexpensively, and each unit can be reset for a blend change.

Write for Technical Bulletin — TODAY

Kates

W. A. KATES COMPANY
Department D.
430 Waukegan Rd.
Deerfield, Illinois

For more information circle **136** on inquiry card.

Jordan Reg. Corp.
Littleford Bros.
Natl. Automatic Prods. Co.
Parker Appliance Co.
Pressure Prods. Industries
R-P & C Valve Div.
Research Appliance Co.
Robbins & Assocs.
Roska Instr. Corp.
Snap-Tite, Inc.
Special Screw Prods. Co.
Uehling Instr. Co.
Vanton Pump & Equipt.
Weatherhead Co.

FITTINGS, Tube and Pipe, Steel

Aeroquip Corp.
Alden Products
Allegheny Ludlum
Autoclave Engineers
Century Controls Corp.
Conant Bros.
Conax Corp.
Conduflex Corp.
Crawford Fitting Co.
Hetherington & Berner
High Pressure Equipt. Co.
Imperial Brass
Littleford Bros.
Natl. Automatic Prods. Co.
Parker Appliance Co.
Robbins Aviation Co.
Scovill Mfg. Co.
Special Screw Products
Uehling Instr. Co.
Unistrut Prods. Co.
Weatherhead Co.

FLAME FAILURE SAFEGUARDS, see Combustion Safeguards

FLANGES, Orifice, see Orifice Flanges

FLANGES, Pipe

FLASH POINT TESTERS, including Cleveland Open Cup, Elliott Closed Cup, Pensky-Martens, and Tage Closed

Amer. Instr. Co.
Boekel & Co.
Central Scientific
Eitzen Co., L. C.
Fisher Scientific
Humboldt Mfg. Co.
Koehler Instr. Co.
Labline, Inc.
Olsen Testing Machine
Precision Scientific
Ruttco Mfg. Co.
Soiltest, Inc.
Weston Electcl. Instr.

FLASHERS

Amglo Corp.
Chatham Electronics
Davis Insts. Div.
Electronic Spec. Co.
E-T-A Products
Fecker, Inc., J. W.
Haydon Mfg. Co.
Kemlite Labs.
Kirkland Co.
Pacific Transducers
Reynolds Electric
Thordarson-Meissner
United Control Corp.
Wallace & Tiernan
Zenith Electric

FLATNESS TESTERS (see also Optical Flats)

Acme Scientific
Baird Assocs.-Atomic Instr.
Bausch & Lomb
Bronoptics Co.
Buhl Optical
Crystal Research Labs.
E & S Optical
Engis Equipt. Co.
Fecker, Inc.
Fish-Schurman
Fosdick Glass
Fruengel, Inc.
Gaertner Scientific
Georator Enterprises
Gordon Enterprises
Howland Optical
Mann Co., W. I.
Lab. Optical
Micrometrical Mfg. Co.
Opplem Co.
Optron Laboratory
Palos Optical
Pan-Technics, Inc.
Phoenix Prec. Instr.
Scherr Co., Inc.
Sheffield Corp.
Sherron Metallic Corp.
Van Keuren Co.,
Zeiss, Inc., Carl
Zenith Optical Lab.

FLATS, Optical, see Optical Flats

FLAW DETECTORS, Chemical

Magnaflux Corp.

FLAW DETECTORS, Magnetic

Aero Electronics
Annis Co.
Commercial Res. Div.
Detectronic Corp.
Dice Co.,
Eder Instr. Co.
Fraser Devel. Lab.
GE
Magnaflux Corp.
Magnetic Analysis Corp.

Miller Instruments
Rowe Engrg. Co.
Rubicon Co.
Sensitive Res. Instr.
Sunshine Scientific
Western Indust. Engrg.

FLAW DETECTORS, Miscellaneous, including Resistance and/or Conductivity, also Holiday and Pin Hole Detectors

Branson Insts. Inc.
Crown Indust. Prods. Co.
Devtronics, Inc.
GE, Apparatus Sales
Hillyer Instr. Co.
Industrial Electronics
Indust. Electronics (Mass.)
Magnaflux Corp.
Peschel Electronics
Teletronics Lab., Inc.
Tinker & Rasor
Vacuum Electronic Engrg.
Viking Instr. Co.

FLAW DETECTORS, Radiography, including Beta-ray and X-ray (see also X-ray)

Can. Rad. & Uran.
Diamond Power Spec. Corp.
High Voltage Engrg. Labs.
Menlo Research Lab.
North Amer. Philips
Nuclear Corp. of Amer.
Nuclear Research Corp.
Std. Electronic Res.
U. S. Radium Corp.

FLAW DETECTORS, Ultrasonic

Branson Instruments
Ercona Corp.
Magnaflux Corp.

FLAW DETECTOR CARS, for Rail Track Testing

Baldwin-Lima-Hamilton
Branson Instruments
Eitzen Co., L. C.
Farnsworth Electronics
Hacker & Co.
Olsen Testing Machine
Sperry Products

FLEXIBLE COUPLINGS, Fractional H. P.

Breeze Corp.
Clifford Mfg. Co.
Continental Diamond Fibre
Electric Tachom. Corp.
Esterline-Angus
Goodrich Co., B. F.
Jan Hardware Mfg. Co
Johnson Co., E. F.
L. & R. Mfg. Co.
Lord Mfg. Co.
Merkle Korff
Millen Mfg. Co.
Phila. Gear Works
Reeves Instr. Corp.
Seamlex Co., Inc.
Servomechanisms, Inc.
Stewart Corp.
Stow Mfg.
Teleflex, Inc.
Vallorbs Jewel Co.
Werner Co.,
White Indust. Div., S. S.

FLIGHT TABLES, see Simulators

FLIGHT TEST INSTRUMENTS

Aero Electronics
Aero Res. Instr. Co.
Airborne Instruments
Analogue Controls, Inc.
Applied Science Corp.
Arnoux Corp.
Autonetics Div.
Avion Div.
Barton Instr. Co.
Bendix, Pioneer-Central
Boonton Radio
Brooks Rotameter
Brush Electronics
Burton Mfg.
Cal-Tronics Corp.
Carroll Co., J. B.
Century Electronics & Instr.
Colvin Labs., Inc.
Commercial Research
Consol. Electrodynamics
Datran Engrg. Corp.
Davies Labs.
Donner Scientific
El-Mec Laboratory
Electro Insts., Inc.
Electronic Assocs.
Engrg. & Res. Corp.
Epsco, Inc.
Farnsworth Electronics
Federal Telephone & Radio
Flight Res., Inc.
Ford Instr. Co.
General Devices Inc.
GE
General Mills Inc.
Genisco Inc.
Giannini & Co.
Goodyear Aircraft
Gray Instr. Co.
Hamilton Watch
Hastings-Raydist
Hathaway Instr. Co.
Helland Div.
Impact Register Co.
Industrial Control Co.
Instr. Associates
Intercontinental Dynamics
Kollsman Instr. Co.
Lessells & Assocs.

Lewis Engrg. Co.
M. B. Mfg. Co.
Marion Electcl. Instr.
Matisa Equipt. Co.
Meriam Instr. Co.
Natl. Aircraft Corp.
North Amer. Instruments
Pacific Scientific
Penn Insts. Div.
Potter Aeronautical Co.
Rahm Insts. Inc.
Revere Corp.
Robertshaw-Fulton
Rubicon Co.
Scientific Enterprises
Sensitive Res. Instr.
Sperry Gyroscope
Statham Labs.
Stavid Engineering, Inc.
Summer Gyroscope Co.
Televiso Corp.
Thwing-Albert
Topp Industries, Inc.
United Electrodynamics
Wa Line, Inc.
Wallace & Tiernan
Waugh Engrg. Co.
Wianko Engrg. Co.
Wollensak Optical
Zoomar Corp.

FLOATS, Miscellaneous (see also Level)

Amer. Hard Rubber Co.
Armstrong Cork
Automatic Control Co.
Bristol Co.
Cooper Co., Clark
Keckley Co.
Lucerne Rubber Co.
Naugatuck Mfg. Co.
Nicholson & Co., W. H.
Schnitzer Alloy Prods.
Shand & Jurs
Sponge Rubber Prods.
Stokes Molded Prods.
Taylor Mfg. Co.
U. S. Rubber
Weber Bros. Metal Wks.

FLOW, Flowmeters indicating RATE of flow. For positive or "quantity" fluid meters, see Flowmeters, Positive Displacement

FLOW CALIBRATING DEVICES, including weighing-displacement types

Ace Glass
Badger Meter Co.
Barnstead Still
Bendix, Pioneer-Central
Brooks Rotameter Co.
Commerical Res. Div.
Computer-Measmts. Corp.
Daystrom Instrument
Exact Weight Scale
Fisher & Porter Co.
Hupp Instrumentation
Leopold & Stevens
Natl. Instr. Labs.
Neptune Meter Co.
Nuclear Research Corp.
Thayer Scale & Engrg.
Toledo Scale Co.

FLOW CONTROLLERS

Accessory Prods. Corp.
Ahrendt Instr. Co.
AiResearch Mfg. Co.
Amer. Meter Co.
Askania Reg. Co.
Assembly Products
Autom. Switch Co.
Automation Prods. Inc.
B-I-F Industries
Bailey Meter Co.
Bogue Elect. Mfg.
Bristol Co.
Brooke Engrg. Co.
Brooks Rotameter
Builders-Providence
Cal-Tronics Corp.
Cash Valve Mfg. Corp.
Century Controls Corp.
Cooper Co., Clark
Conoflow Corp.
Cutler-Hammer
Fischer & Porter Co.
Foster Engrg. Co.
Foxboro Co.
Gar Prec. Parts, Inc.
GE, Apparatus Sales
Genl. Reg. Corp.
Gordon Co.
Greiner Co., Emil
Hagan Corp.
Hays Corp.
Hays Mfg. Co.
Industrial Control Panel
Industrial Electronics
Indust. Instr. Corp.
Infilco
Johnson Service Co.
Jordan Reg. Corp.
Kates Co. W. A.
Leslie Co.
Manning, Maxwell & Moore
Manostat Corp.
Mason-Neilan Div.
McDonnell & Miller
Metrotype Corp.
Milton Roy Co.
Minneapolis-Honeywell
Moore Products
Nucear Research Corp.
Penn Insts. Div.
Phoenix Prec. Instr.
Photobell Co.
Potter Aeronautical Co.
Power Engrg. & Equipt.
Powers Reg. Co.
Proportioneers, Inc.
Ramapo Instr. Co.
Reliance Instr. Mfg. Corp.
Republic Flow Meters
Research Control Instr. Co.
Rivett Lathe & Grinder
Rockwell Co., W. S.
Roy Co., Milton
Servo-Tek Products
Shallcross Controls
Simplex Valve & Meter Co.
Sparling Meter Co.
Swartwout Co.
Taylor Instr. Cos.
Waterman Engrg Co.
Waukee Engrg Co.
Weighing Components
Weston Electcl. Instr.

FLOW INSTRUMENTS, Granular Materials

Askania Reg. Co.
B-I-F Industries
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bin-Dicator Co.
Builders-Providence
Control Engrg. Co.
Dietert Co.
Fielden Instr. Div.
GE, X-Ray Corp.
Gilmore Industries
Hadley Assoc.
Industrial Process Engr.
Instruments Inc.
Jarco Services
Jeffrey Mfg. Co.
Merrick Scale Co.
Nuclear Research Corp.
Ohmart Corp.
Omega Machine
Power Engrg. & Equipt.
Proportioneers, Inc.
R.K.L. Mfg. Co.
Richardson Scale
Robertshaw-Fulton
Thayer Scale & Engrg.
Toledo Scale Co.
Wallace & Tiernan
Weighing Components

FLOW NOZZLES

Airflo Instr. Co.
AiResearch Mfg.
Askania Reg. Co.
B-I-F Industries
Bacharach Indust. Instr.
Bailey Meter Co.
Bristol Co.
Builders-Providence
Commeriacl Res. Div.
Foxboro Co.
Gar Prec. Parts, Inc.
Hagan Corp.
Hays Corp.
Jessup Engrg. & Devel. Co.
Jordan Reg. Corp.
Keller & Co.
King Engrg.
Minneapolis-Honeywell
National Instr. Labs.
OPW Corp.
Penberthy Injector Co.
Penn Insts. Div.
Phoenix Prec. Instr.
Republic Flow Meters
Simplex Valve & Meter Co.
Taylor Instr. Cos.
Willey's Carbide Tool Co.
Worley Jewel Co.

FLOW PICKUPS, Turbine Type (see also Orifice Plates, Venturi Tubes, Pitot Tubes, Flow Nozzles)

Commeriacl Res. Div.
Fischer & Porter Co.
Potter Aeronautical Co.
Propulsion Devel. Lab.
Waugh Engrg. Co.

FLOW PROVERS

Amer. Meter Co.
Commerical Res. Div.
Indust. Instr. Corp.
Power Engrg. & Equipt.
Precision Scientific
Superior Meter Co.

FLOW REGULATORS, Self Operated

Accessory Prods. Corp.
Amer. Meter Co.
Askania Reg. Co.
B-I-F Industries
Bristol Co.
Brooks Rotameter
Cash Valve Mfg. Corp.
Cutler-Hammer
Fischer & Porter Co.
Gar Prec. Parts, Inc.
Hays Mfg. Co.
Jordan Reg. Corp.
Kates Co., W. A.
Leslie Co.
Manostat Corp.
McDonnel & Miller
Minneapolis-Honeywell
Phila. Pump & Machy.
Photobell Co.
Propulsion Devel. Lab.
Republic Flow Meters
Research Controls
Robertshaw-Fulton
Simplex Valve & Meter Co.
Sparling Meter Co.
Squires Co., C. E.
Waterman Engrg. Co.

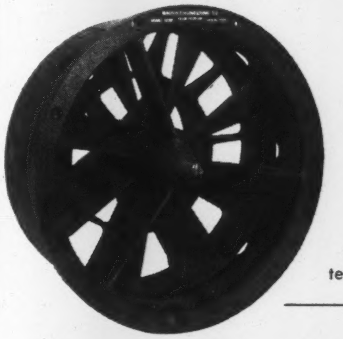
FLOW TOTALIZERS

Amer. Meter Co.
Askania Reg. Co.
Automation Prods. Inc.
B-I-F Industries
Bailey Meter Co.
Bendix, Eclipse-Pioneer
Bendix, Pioneer-Central
Berkeley Div.
Bristol Co.
Brooks Rotameter

Waugh

TURBINE FLOWMETERS

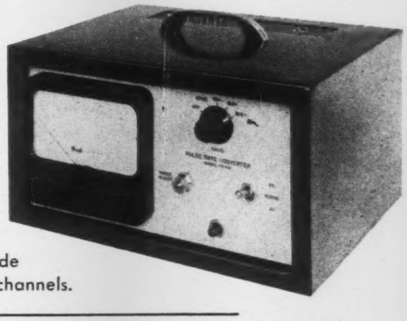
for APPLICATIONS in:



MISSILES

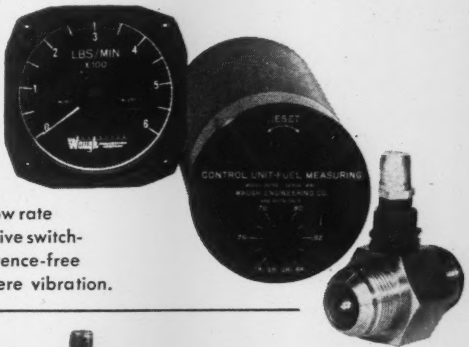
Lightweight aluminum Flow Pickups for flight or ground testing insert in propellant ducts of guided missiles. Flow rates from 20 to 6000 gallons per minute are covered in sizes 4" through 11". Output is suitable for telemetering or ground recording.

LABORATORY



FR series Pulse Rate Converters convert frequency output of any turbine flowmeter into a DC signal. Models include cabinet or relay rack mounting, with outputs for potentiometer recorders or oscillographs. Available features include built-in indicator, and multiple input channels.

AIRCRAFT



New, completely transistorized Airborne Fuel Measuring System with specific gravity adjustment provides direct indication of both fuel flow rate and total fuel consumed. Exclusive switch-type flow pickup gives interference-free operation in conditions of severe vibration.

GENERAL SERVICE

Standard FL series Flow Pickups for use in aircraft, chemical processing, food, and petroleum industries, measure flows from .065 to 400 gallons per minute. Applications include flow rate indication, recording, and control, as well as indication and control of totalized flow.

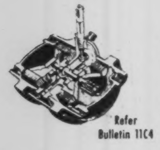
Waugh ENGINEERING COMPANY
FLUID FLOW MEASURING EQUIPMENT
7842 BURNET AVENUE, VAN NUYS, CALIFORNIA—STanley 7-8491

For more information circle 137 on inquiry card.

successful performance...
BARTON
MODEL 214

...even under extreme conditions!

BARTON DP TRANSMITTERS accurately transmit flow, liquid level, and/or differential pressure with high speed, high sensitivity and low air consumption, regardless of **temperature** variation, **pulsation,** and severe **over-range.** Direct mechanical indicator insures continuity of operation on air failure; and together with accessible adjustments, simplifies field calibration. **For further information request bulletin 214-1 or contact BARTON sales engineers, located in most principal cities.**



MODEL 199 METER BODY

Refer
Bulletin 11C4
MODEL 200 INDICATOR

Refer
Bulletin 11C4
MODEL 202 RECORDER

Refer
Bulletin 211-1
MODEL 211 FLOW SWITCH

BARTON INSTRUMENT CORPORATION
INDUSTRIAL INSTRUMENTS
580 MONTEREY PASS ROAD, MONTEREY PARK, CALIFORNIA

For more information circle **138** on inquiry card.

FLOW CORPORATION

advanced flow measuring instruments
for industry and research

leaders in hot wire anemometry
special pressure probes
micromanometers

283 Concord Avenue, Cambridge 38, Mass.

For more information circle **139** on inquiry card.

BAILEY
AREA METER TRANSMITTERS

Transmits a signal which is directl proportional to rate of flow to indicating recording, integrating, and/or contro ling equipment at remote stations.

For rate of flow measurement o water, kerosene, gasoline, oil, tar chemicals, distillates, and refrigerants Measures rate of flow over a 50 to range. Mounts directly in pipe line.

Signals may be transmitted either electrically or pneumatically.

Request Product Specification E22-4 for electric transmission and Product Specification P22-4 for pneumatic transmission.

BAILEY METER COMPANY
1041 IVANHOE ROAD CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For more information circle **140** on inquiry car

Builders-Providence
Commercial Res. Div.
Computer-Measmts. Corp.
Engineering Res. & Devel.
Fischer & Porter Co.
Foxboro Co.
GE
Hagan Corp.
Hays Corp.
Henszey Co.
I-L-S Instr. Corp.
Industrial Instr.
Internat. Instr. Co.
Leeds & Northrup
Leupold & Stevens
Mason-Neilan Div.
Maxson Insts.
Metrotype Corp.
Minneapolis-Honeywell
National Instr. Labs.
Norden-Ketay
Penn Insts. Div.
Potter Aeronaut. Co.
Potter Instr. Co.
Ramapo Instr. Co.
Ransom Research
Republic Flow Meters
Revere Corp.
Simplex Valve & Meter Co.
Smith Meter
Southw. Indust. Electronics
Sparling Meter Co., Inc.
Sparton Cont. Systems
Streeter-Amet
Taylor Instr. Cos.
Thayer Scale & Engrg.
Wallace & Tiernan
Weston Electcl. Instr.

FLOW TRANSMITTERS (see also Pressure Differential Tranmitters)

Amer. Meter Co.
Automation Prods., Inc.
B-I-F Industries
Bailey Meter Co.
Barton Instr. Co.
Bendix, Pioneer-Central
Bristol Co.
Brooks Rotameter
Commerical Res. Div.
Fischer & Porter Co.
Foxboro Co.
Hagan Corp.
Hays Corp.
Indust. Instr. Corp.
Inertial Instruments, Inc.
Leupold & Stevens
Manning, Maxwell & Moore
Mason-Neilan Div.
Minneapolis-Honeywell
Moore Products
Penn Insts. Div.
Potter Aeronautical Co.
Republic Flow Meters
Revere Corp. of Amer.
Simplex Valve & Meter Co.
Sparling Meter Co., Inc.
Sparton Cont. Systems
Wallace & Tiernan

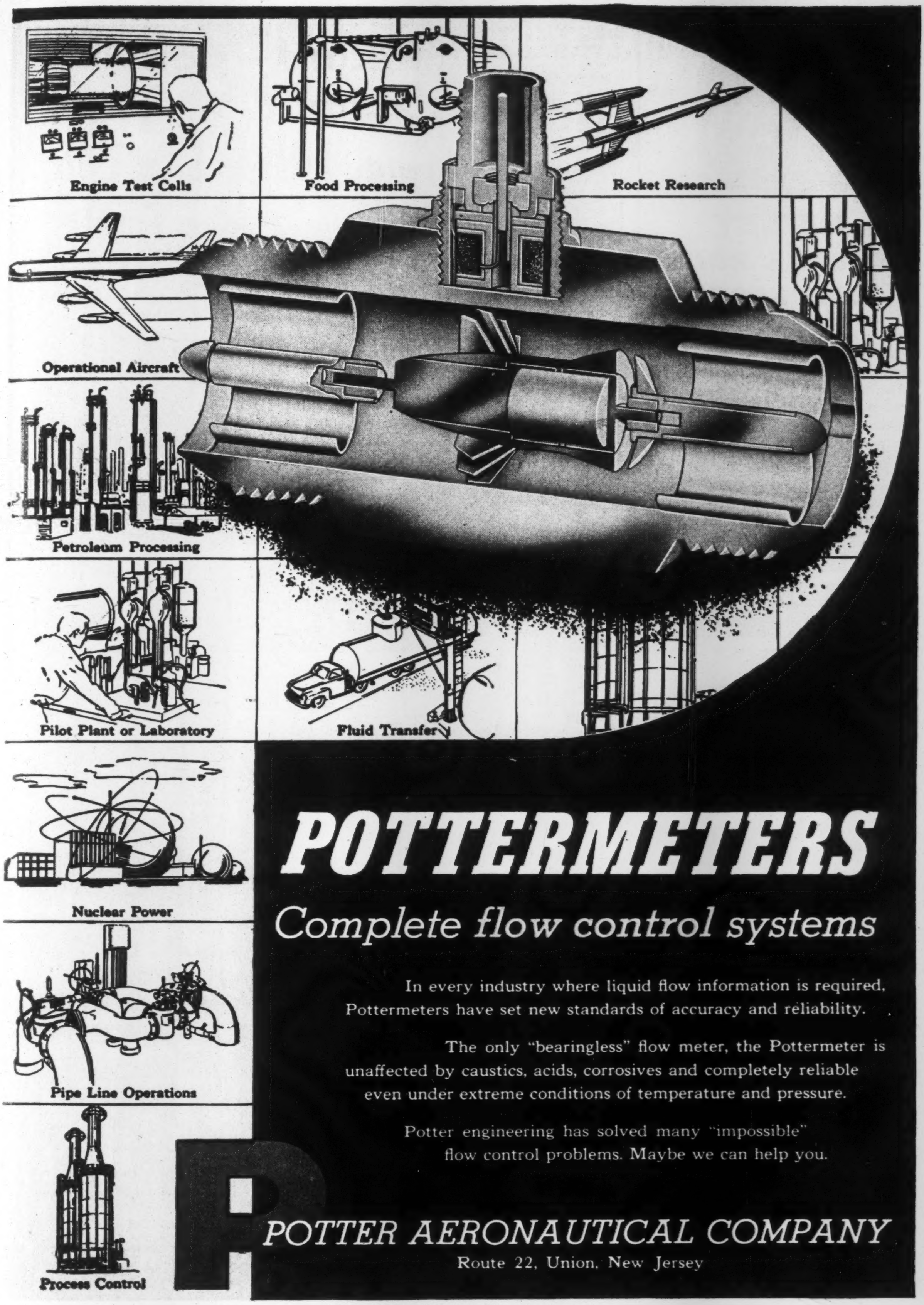
FLOWMETER LEVELLING SADDLES, see Levelling Saddles

FLOWMETERS, Area, including Cone and Disc Type, Cylinder and Piston Type, Free Float Type

Amer. Gas Furnace Co.
Amer. Instr. Co.
Askania Reg. Co.
B-I-F Industries
Bayley Instr. Co.
Bellco Glass
Bendix-Friez
Bowser Inc.
Bristol Co.
Brooks Rotameter
Commerical Res. Div.
DeZurick Shower Co.
Dwyer Mfg. Co.
Fischer & Porter Co.
Fish-Schurman
Gems Co.
Greiner Co., Emil
Greiner Glassblowing Lab.
Hallikainen Instruments
Hammel-Dahl
Hays Corp.
Hoke Inc.
Jacoby-Tarbox
King Engrg. Co.
Knotes Glass
Leupold & Stevens
Mercury Glass Co.
Minneapolis-Honeywell
Natnonal Meter Co.
New Jersey Meter Co.
Nuclear Corp. of Amer.
Penn Insts. Div.
Phoenix Prec. Instr.
Podbielniak, Inc.
Precision Scientific
Schrader's Son, A.
Schutte & Koerting
Service Recorder Co.
Sticht Co., Herman M.
Taylor Instr. Cos.
Thermco Labs.
Waukee Engrg. Co.

FLOWMETERS, Area, Orifice and Plug Type

Amer. Meter Co.
B-I-F Industries
Bacharach Indust. Instr. Co.
Bailey Meter Co.
Barton Instr. Co.
Brooks Rotameter
Builder-Providence
Commerical Res. Div.
Fischer & Porter
Greiner Glassbowing Labs.
Hagan Corp.
Hallikainen Instruments
Hastings Raydist
Hays Corp.
Henszey Co.


Engine Test Cells
Food Processing
Rocket Research
Operational Aircraft
Petroleum Processing
Pilot Plant or Laboratory
Fluid Transfer
Nuclear Power
Pipe Line Operations
Process Control

POTTERMETERS

Complete flow control systems

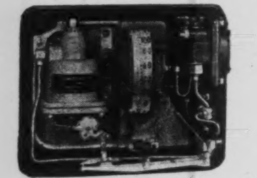
In every industry where liquid flow information is required, Pottermeters have set new standards of accuracy and reliability.

The only "bearingless" flow meter, the Pottermeter is unaffected by caustics, acids, corrosives and completely reliable even under extreme conditions of temperature and pressure.

Potter engineering has solved many "impossible" flow control problems. Maybe we can help you.

POTTER AERONAUTICAL COMPANY
Route 22, Union, New Jersey

For more information circle **141** on inquiry card.



BAILEY SQUARE ROOT CONVERTER

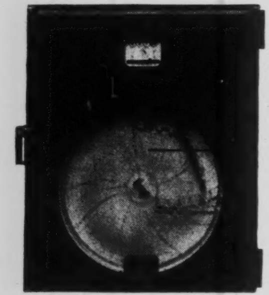
- Extracts the square root of nonlinear pneumatic signals from flow differential pressure transmitters. The converter then transmits a pneumatic signal directly proportional to rate of flow to indicating, recording, integrating, and/or control equipment.

By extracting the square root function, the Bailey Square Root Converter gives full control rangeability to differential pressure transmitters.

Request Product Specification P22-5.

BAILEY METER COMPANY
1041 IVANHOE ROAD CLEVELAND, O.
Bailey Meter Company Ltd. Montreal, Canada

For more information circle **142** on inquiry card.



REPUBLIC FLOW METERS

Republic electrical type flow meters are available for measuring the flow of all types of liquids and gases. Meter bodies are built for metering fluids at line pressures up to 10,000 lb. per sq. in. and for all ranges of differential pressure. The reading instruments — indicator, recorder and integrator—are of the remote reading type and can be located any distance from the point of flow measurement.

WRITE FOR DATA BOOK 702

REPUBLIC FLOW METERS CO.
2240 Diversey Pkwy. Chicago 47, Ill.

REPUBLIC INSTRUMENTS • CONTROLS

For more information circle **143** on inquiry card.

Industrial Instr. Corp.
Mason-Neilan Div.
Meriam Instr. Co.
Minneapolis-Honeywell
Precision Scientific
Ramapo Engrg. Co.
Republic Flow Meters
Robinson Orifice
Rockwell Register Corp.
Simplex Valve & Meter
Southw. Indust, Eelectron.
Taylor Instr. Cos.
Trimount Instr. Co.
Wallace & Tiernan

FLOWMETERS, Electromagnetic and Magnetic

Automation Prods. Inc.
Berkely Div.
Commercial Res. Div.
Crescent Engrg. & Res. Co.
Fischer & Porter Co.
Foxboro Co.
GE, Instr. Dept.
Gems Co.
Hydraulic Controls Co.
Instr. Associates
Intercontinental Dynamics
Nuclear Corp. of Amer.
Potter Aeronautical Co.
Revere Corp.
Sangamo Electric
Sparton Cont. Systems
Technical Equipt. Co.
Waugh Engrg. Co.

FLOWMETERS, Inferential Type, including Orifice, Nozzle, Pitot, Venturi; for Air, Gas, Liquid or Steam; Indicating and/or Recording

Ace Glass, Inc.
Aero Research
AiResearch Mfg.
Airflo Instr. Co.
Amer. Meter Co.
Askania Reg. Co.
Autom. Temp. Contr. Co.
B-I-F Industries
Bacharach Indust. Instr.
Bailey Meter Co.
Barton Instr. Corp.
Bendix, Eclipse-Pioneer
Bendix-Friez
Bethlehem Apparatus
Bristol Co.
Brooks Rotameter
Builders-Providence
Cambridge Instr. Co.
Campbell Co.
Central Scientific
Commercial Iron Works
Corning Glass Works
Custom Scientific
Daniel Orifice Fitting
Dwyer Mfg. Co.
Dynamic Instr. Co.
Elematic Equipt. Corp.
Ellison Draft Gage
Fischer & Porter Co.
Flow Corp.
Foster Engrg. Co.
Foxboro Co.
Gems Co.
Green Rectifier Co.
Greiner Co., Emil
Greiner Glassblowing Lab.
Griebel Co.
Hagan Corp.
Hastings—Raydist
Hays Corp.
Hill & Co.
Hoke, Inc.
Hydraulic Controls Co.
Ideal-Aerosmith
Illinois Testing Labs.
Industrial Instr. Corp.
International Filter
King Engrg.
Kollsman Instr. Div.
Leeds & Northrup
Leupold & Stevens
Linde Air Prods.
Liquidepth Indicators
Manning, Maxwell & Moore
Mason-Neilan Div.
Maxson Instr. Div.
Meriam Instr. Co.
Minneapolis-Honeywell
Moore Products
N. J. Meter
National Instr. Labs.
Penn Insts. Div.
Permutit Co.
Phoenix Prec. Instr.
Pitometer Log Corp.
Precision Scientific
Prec. Thermom. & Insts.
Precision Tube Co.
Ramapo Instr. Co.
Refinery Supply Co.
Republic Flow Meters
Revere Corp.
Robinson Orifice
Rockwell Mfg. Co.
Schutte & Koerting
Scientific Glass App.
Scientific Instr. Co.
Simplex Valve & Meter Co.
Southw. Indust. Electron.
Superior Meter
Taylor Instr. Cos.
Trimount Instr. Co.
Turner Electric
Uehling Instr. Co.
U. S . Gauge Div.
Universal X-Ray Prods.

FLOWMETERS, Open Channel, including Flume, V-notch, Weir (see also Waste)

B-I-F Industries
Bailey Meter Co.
Bristol Co.
Builders-Providence
DeZurik Shower Co.
Elect. Indicator Corp.
Fielden Instr. Div.
Fischer & Porter Co.
Foxboro Co.
Gurley, W. & L. E.
Hagan Corp.
Hays Corp.
Industrial Instr. Corp.
Jordan Reg. Corp.
Leupold & Stevens
Mason-Neilan Div.
Minneapolis-Honeywell
Penn Insts. Div.
Republic Flow Meters
Scientific Instr. Co. Calif.
Simplex Valve & Meter Co.
Sparling Meter
Swartwout Co.
Taylor Instr. Cos.
Trans-Weigh Co.
Victory Engrg. Corp.
Westberg, Mfg. Co.
White Co.

FLOWMETERS, Open-Stream, see Flowmeters, Open Channel

FLOWMETERS, Positive Displacement, including Consumer Gas, Nutating Piston or Disc, Oscillating Piston, Propeller, Reciprocating Piston and Rotary Piston, Water Meters, etc.

Amer. Instr. Co.
Amer. Meter Co.
Askania Reg. Co.
B-I-F Industries
Badger Meter Co.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Barton Instr. Corp.
Bowser, Inc.
Bristol Co.
Brodie Co.
Brooks Rotameter
Buffalo Meter Co.
Builders-Providence
Cal-Tronics Corp.
Commercial Res. Div.
Electrical Devel.
Engineering Res. & Devel.
Fischer & Porter Co.
Foxboro Co.
Gems Co.
Gilmore Industries
Gurley, W. & L. E.
Hagan Corp.
Hays Corp.
Henszey Co.
Hetherington & Berner
Industrial Instr.
Jarco Services

Record -- Control Liquid Volume with NIAGARA METERS

- Chemicals
- Oils & Solvents
- Cold & Hot Water
- Syrups, etc.

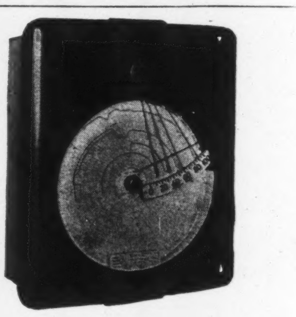
Single nutating piston volumetric displacement metering, with integrating registers, or explosion-proof Electricontact construction. Indicating, recording and controlling attachments also available.

Inquire now!

BUFFALO METER CO.
2906 MAIN STREET BUFFALO, N. Y.

For more information circle **144** on inquiry card.

GALLONS
190
10
180
20
170
30
160
40
150
50
140
60
130
70
120
80
110
100
90



BAILEY *Fluid Meters* FOR STEAM-LIQUIDS-GASES

- Bailey Fluid Meters are designed to indicate, record, and/or integrate the flow of steam, liquids, or gases under practically any pressure or temperature conditions.

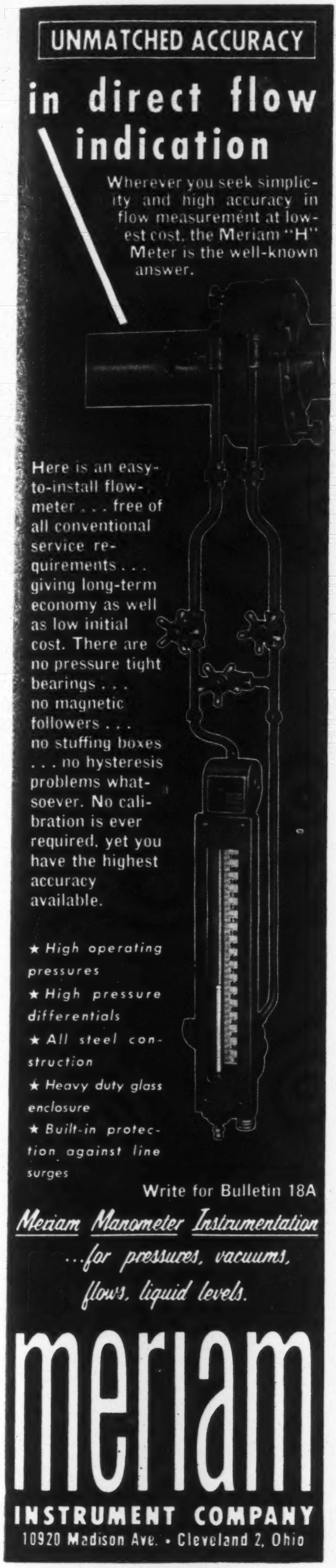
One to four records may be made on a single 12 in. circular chart or two records of flow may be combined in the same case with two integrators or two pneumatic controllers.

Either pneumatic or electric transmission may be used when it is desired to place the Receiver Recorder at a distance from the primary element.

Request Bulletin G15-1.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd. Montreal, Canada

For more information circle **145** on inquiry card.



UNMATCHED ACCURACY

in direct flow indication

Wherever you seek simplicity and high accuracy in flow measurement at lowest cost, the Meriam "H" Meter is the well-known answer.

Here is an easy-to-install flowmeter . . . free of all conventional service requirements . . . giving long-term economy as well as low initial cost. There are no pressure tight bearings . . . no magnetic followers . . . no stuffing boxes . . . no hysteresis problems whatsoever. No calibration is ever required, yet you have the highest accuracy available.

- ★ *High operating pressures*
- ★ *High pressure differentials*
- ★ *All steel construction*
- ★ *Heavy duty glass enclosure*
- ★ *Built-in protection against line surges*

Write for Bulletin 18A

Meriam Manometer Instrumentation ...for pressures, vacuums, flows, liquid levels.

meriam

INSTRUMENT COMPANY
10920 Madison Ave. • Cleveland 2, Ohio

For more information circle **146** on inquiry card.

BROOKS LEADERSHIP *achieved by design*

This AR-MET ROTAMETER...

POSITIVE INDICATION
A magnetic follower that never loses bond . . . offers minimized friction, minimized hysteresis.

ALL METAL CONSTRUCTION
Eliminates packing and packing problems. Holds on even the most difficult services without a chance of leakage.

THRU-BOLTED DESIGN
Easy to assemble and disassemble. No frozen stud bolts . . . no drilling and tapping.

TAKES PRACTICALLY ALL FLUIDS OFF THE "HARD TO HANDLE" LIST

If you're working with highly penetrable fluids . . . high temperatures, high pressures . . . Brooks Ar-Met Rotameters are made to order for you.

The Brooks Ar-Met Rotameter with Mag/Na/Vue indicating extension is shown . . . however, Ar-Met meters are also available with six other alarm and transmission extensions, both electrical and pneumatic. Write for Bulletin 130.

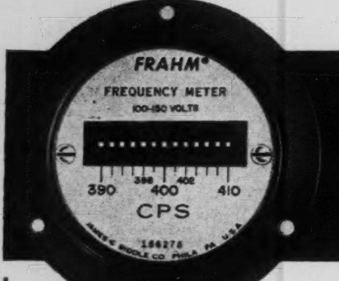
Ar-Met and Mag/Na/Vue are trade-names.

Ar-Met Rotameter Data Available in Bulletin 130.

a complete line... **BROOKS**™ **ROTAMETERS** *...for every service* ®

BROOKS ROTAMETER COMPANY
104 EIGHTH STREET • LANSDALE, PA.

For more information circle **147** on inquiry card.



FRAHM® FREQUENCY METERS

- .... in Switchboard, Miniature and Portable types
- .... indicate alternating current frequency from 15 up to 1500 cycles per second
- .... applicable to pulsating or interrupted D-C as well as A-C supply circuits

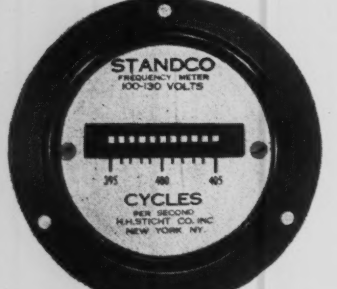
Frahm Resonant Reed Miniature Sealed Type Frequency Meters are hermetically sealed to withstand excessive humidity, dust, fungus attack, moisture (as aboard ship) and other destructive atmospheric conditions. Available in 2½" and 3½" sizes.

Frahm Frequency Meters can be specially designed to your specifications for range, methods of activating, scale graduations, etc. We invite your correspondence.

WRITE FOR BULLETIN 32-I. B-523

JAMES G. BIDDLE CO.
Electrical & Scientific Instruments
1316 ARCH STREET, PHILADELPHIA 7, PA.

For more information circle **148** on inquiyr card.



"STANDCO"
VIBRATING REED
FREQUENCY METERS

ACCURACY ±.5%

RUGGED—DEPENDABLE
Normal Frequencies:
25, 50, 60 or 400 cycles
Special Ranges:
from 15-1500 cycles

AVAILABLE IN FOLLOWING TYPES:
PANEL MOUNTING: 3½" flush bakelite, metal or hermetically sealed cases
Meet all MIL specs.
SWITCHBOARD MOUNTING: 7¼" round surface, or 4½" square semi-flush cases
PORTABLES: In large or small cases
Write for Bulletin 805

HERMAN H. STICHT CO., INC.
27 PARK PLACE NEW YORK N.Y.

For more information circle **149** on inquiry card.

Labline, Inc.
Lapp Insulator
Littelfuse Inc.
Mason-Neilan Div.
Maxson Corp.
Minneapolis-Honeywell
Neptune Meter Co.
Nuclear Research
Potter Aeronautical Co.
Precision Scientific
Proportioneers, Inc
Ramapo Engrg. Co.
Republic Flow Meters
Revere Corp.
Richardson Scale Co.
Rockwell Mfg. Co.
Service Recorder Co.
Schutte & Koerting
Smith Corp., A. O.
Smith Meter Co.
Sparling Meter Co.
Sprague Meter Co.
Streeter-Amet
Superior Meter Co.
Technical Equipt. Co.
Thayer Scale & Engrg.
Trimount Instr. Co.
Uehling Instr. Co.
Virginia Electronics
Victory Engrg. Corp.
Waugh Engrg. Co.
Westport Electric
Worthington Pump
Yellow Springs Instr.

FLOWMETERS, Positive Displacement, Low Flow

Amer. Meter Co.
Askania Reg. Co.
Fischer & Porter
Hastings-Raydist
Hetherington & Berner
Gems Co.
Neptune Meter Co.
Penfield Mfg. Co.
Revere Corp. of Amer.
Service Recorder Co.

FLOWMETERS, Sight

Bausch & Lomb
Bowser, Inc.
Brooks Rotameter
Builders-Providence
Commercial Res. Div.
DeJur-Amsco
Fischer & Porter Co.
G-M Labs.
GE
Henszey Co.
Infilco
Jacoby-Tarbox
Jerguson Gage
Jordan Reg. Corp.
King Engrg. Corp.
Meyer-Opticraft
Penfield Mfg. Co.
Phoenix Prec. Instr.
Podbielniak, Inc.
Republic Mfg.
Revere Corp. of Amer.
Sarco Co.
SCAM Instr. Corp.
Schutte & Koerting
Shand & Jurs
Selas Corp.
Trimount Instr.
Trinity Equipt. Co.
Triplett Electcl. Instr.
Uehling Instr. Co.
Waukee Engrg. Co.

FLOWMETERS, Vane Type

Bendix-Friez
Bendix, Pioneer-Central
Elematic Equipt. Corp.
Hays Corp.
Henszey Co.
Illinois Testing Labs.
Industrial Instr. Corp.
Jordan Reg. Corp.
Mason-Neilan Div.
Penn Insts. Div.
Potter Aeronautical Co.
Power Engrg. & Equipt.
Revere Corp.
Scully-Jones
Simplex Valve & Meter
Sparling Meter Co.
Sperry-Son Well Surveying
Waugh Engrg. Co.

FLUE GAS ANALYZERS, see Gas Analyzers, also Combustion

FLUID METERS, GAS, see Flowmeters, Positive Displacement

FLUID METERS, Liquid, see Flowmeters, Positive Displacement

FLUID METERS, Quantity, see Flowmeters, Positive Displacement

FLUORESCENCE INDICATORS

Can Rad. & Uran.
Kaye Devel. Co.
Nuclear Corp. of Amer.
Phoenix Prec. Instr.

FLUORESCENT CHEMICALS

Baker Chem. Co.
Burton Mfg. Co.
Can. Rad. & Uran.
DuPont
Laboratory Specialties
Metalphoto Corp.
Nuclear Corp. of Amer.
Precise Measmts. Co.
Switzer Bros.
Sylvania Elect. Prods.
Ultra-Violet Prods., Inc.
U. S. Radium Corp.

FLUORESCENT LIGHTING TESTERS

Eitzen Co.
Ideal Industries
Littlefuse, Inc.
Menlo Research Lab.
Sylvania Elect. Prods.

FLUORESCENT MATERIALS, see Luminescent

FLUORESCENT MERCURY VAPOR TUBES, see Light Sources

FLUOROMETERS

Amer. Instr. Co.
Beckman Div.
Biddle Co., James G.
Calectron, Inc.
Coleman Insts.
Farrand Optical
Fisher Scientific
Jarrell-Ash
Pfaltz & Bauer
Phoenix Prec. Instr.
Photovolt Corp.

FLUOROSCOPES

Balteau Elect. X-Ray Dept.
Dice Co.
GE
Kelley-Koett
North Amer. Philips Co.
Patterson Screen Div.
Picker X-Ray Corp.
Universal X-Ray Prods.,
Westinghouse, X-Ray

FLUX, Brazing, Soldering, Welding

Air Reduction Sales
Allen Co., Inc.
All-State Weld. Alloys
Alpha Metals
Amer. Platinum Wks.
Amer. Silver Co.
Atkins & Co.
Bastian Bros.
Belmont Smelt. & Ref.
Chase Brass & Copper
Division Lead Co.
Dixon, Inc.
DuPont
Fansteel Metallurgical
Fusion Engrg. Co.
GE
Grayhill
Handy & Harman
Harshaw Chemical
Hi-Grade Alloy Corp.
Hubbell Metals, Inc.
Imperial Brass Mfg. Co.
Johnson Gas Appliance
Kester Solder Co.
Krembs & Co.
Linde Air Products
Mallory & Co., P. R.
Marshall Co.
Mico Instr. Co.
National Cylinder Gas
Ney Co.
Ohio Carbon Co.
Sherman & Co.
Superior Flux Mfg. Co.
Technical Soldering Co.
Wall Colmonoy Co.
Westinghouse Electric

FLUXMETERS, see Magnetic Field Strength Indicators

FOIL, Precious Metals (see also Ribbon)

Alpha Metals
Amer. Platinum Wks.
Amer. Silver Co.
Baker & Co.
Bishop & Co., J.
Cohn Corp., Sigmund
Fansteel Metallurgical
General Plate Div.
Hamilton Watch
Handy & Harman
Ney Co.
Reynolds Metals Co.
Secon Metals Corp.
Sherman & Co.

FOLDING ENDURANCE TESTERS, Paper, see Paper Test

FOOT CANDLE INDICATORS, see Illumination Instruments

FORCE MEASURING EQUIPMENT (see also Torque)

Aero Electronics
Allegany Instr. Co.
Asch Equipt. Co.
Askania Reg. Co.
Askania-Werke, A. G.
Atlantic Research
Autom. Temp. Contr. Co.
Avion Div.
B & F Instr.
Baldwin-Lima-Hamilton
Bristol Co.
Brush Electronics
Bush Assocs.
Century Geophysical
Chatillon & Sons
Clevite-Brush
Consol. Electrodynamics
Crescent Engrg. & Res. Co.
Daytronic Corp.
Dillon & Co.
Donner Scientific
Emery Co.
Endevco Corp.
Engineering Res. & Devel.
Exline Engrg. Co.
Fairbanks, Morse & Co.
GE, Apparatus Sales
GE, Instrument Dept.
Genisco, Inc.
Gilmore Industries
Gulton Mfg. Co.
Hunter Spring Co.
Indikon Co.
Industrial Electronics
Industrial Engrg. Corp.
Lessells & Assocs.
Link Engrg. Co.
Morehouse Machine
North Amer. Insts.
Pacific Scientific
Radiation, Inc.
Rea Co., J. B.
Republic Flow Meters
Schaevitz Engineering
Statham Labs.
Steel City Testing Machs.
Stewart Instr. Co.
Taylor Instr. Cos.
Webster Instr. Inc.
Wiancko Engrg. Co.

FOREWARN DETECTORS, for Locating Hidden Weapons, see Metal Detectors

FORGINGS, Small, Precision

Chase Brass & Copper
Gorton Mach. Co.
Haynes Stellite
Jessop Steel
Keystone Carbon Co.
Mallory & Co., P. R.
Reynolds Metals Co.
Scovill Mfg. Co.
Stafford Co.

FORKS, Synchronization

Amer. Time Prods.
Elect. Tachometer Corp.
Gaertner Scientific
Leeds & Northrup
MacLeod & Hanopol
McShan Devel. Co.
Philamon Labs.
Riverbank Labs.
Times Facsimile Corp.
Welch Mfg. Co., W. M.

FORKS, Tuning, Including Electrically Driven

Allied Products Div.
Amer. Instr. Co.
Amer. Time Prods.
Bunnell & Co.
Cambridge Instr. Co.
Central Scientific
Century Geophysical
Chatillon & Sons
Chicago Apparatus Co.
Electronic Prods. Co.
Elect. Tachom. Corp.
Engineering Labs., Inc.
Fecker, Inc.
Gaertner Scientific
GE
General Radio
Hathaway Instr. Co.
Heiland Div.
Hormell Instr. Co.
Industrial Test Equipt.
Leeds & Northrup
McShan Devel. Corp.
Metron Instr. Co.
Miller Instruments
Narda Corp.
Philamon Labs.
Phipps & Bird
Riverbank Labs.
Sherron Metallic Corp.
Standard Elect. Time
Stoelting Co.
Times Facsimile Corp.
Varo Mfg. Co.
Welch Mfg. Co., W. M.

FORKS, Vacuum Driven

Cambridge Instr. Co.
Gaertner Scientific
General Radio
Industrial Test Equipt.
McShan Devel. Corp.
Philamon Labs.
Riverbank Labs.
Times Facsimile Corp.

FRACTIONAL HORSEPOWER MOTORS, see Motors, Fractional Horsepower

FRACTIONATING COLUMNS, see Distillation

FREENESS TESTERS

Bristol Co.
Dietert Co.
Testing Machines, Inc.
Williams Apparatus Co.

FREQUENCY ANALYZERS, see Spectrum

FREQUENCY CHANGERS

American Electronics
Bekey Electric
Boonton Radio
Commercial Res. Div.
Eastern Air Devices
Eicor, Inc.
Electronic Spec. Co.
GE, Apparatus Sales
I-L-S Instr. Corp.
Indust. Test Equipt. Co.
Lampkin Labs., Inc.
Philamon Labs.
Sorensen & Co.
Varo Mfg. Co.
WacLine, Inc.

FREQUENCY CONTROLLERS

A-V Mfg. Corp.
Berkeley Div.
Browning Labs., Inc.
Electronic Spec. Co.
Feiler Engrg.
GE
Hallikainen Insts.
Hormell Instr. Co.
Hupp Instrumentation
I-L-S Instrument
Kellogg Switchboard
Leeds & Northrup
Magnetic Instr. Co.
Magnetic Res. Corp.
Maxson Instr. Div.
Metrotype Corp.
Minnesota Electronics
Photometer Log Corp.
Potter Aeronautical Co.
Potter Instr. Co.
Servo Corp. of Amer.
Std. Electronic Res.
Stewart Instr. Co.
Varo Mfg. Co.
WacLine, Inc.
Waugh Engrg. Co.

FREQUENCY INDICATOR STANDARDS, see Standards, Frequency

FREQUENCY INDICATORS and/or RECORDERS, Electronic

Advance Electronics
Aero Instr. Co.
Air-O-Tronics
Aircraft Armaments
American Electroneering
Avion Div.
B & H Instr. Co.
Berkeley Div.
Berkshire Labs.
Biddle Co., James G.
Bristol Co.
Browning Labs.
Brush Electronics
Burlington Instr. Co.
Clarke Instr. Corp.
Commercial Res. Div.
Computer Co. of Amer.
Computer-Measmts. Corp.
Conn. Ltd.
Daven Co.
Davenport Mfg. Co.
DeJur Amsco
Detectron Co.

Diatron Co.
Donner Scientific
Electrical & Physical Instr.
Electro-Pulse, Inc.
Electro-Tech Equipt. Co.
Electronic Devel. Co.
Electronic Spec. Co.
Electronic Tube Co.
El Mec Labs.
El-Tronics Inc.
Engineering Res. & Devel.
Epic, Inc.
Esterline-Angus
F. R. Machine Works
Farnsworth Electronics
Federal Telephone & Radio
Feiler Engrg.
Furst Electronics
GE, Apparatus Sales
GE, Telechron Dept.
General Radio Co.
Gertsch Products
Harvey Radio Labs.
Hastings-Raydist
Hathaway Instr. Co.
Helipot Div.
Hewlett-Packard
Hickok Electcl. Instr.
Hupp Instrumentation

Hycon Electronics
I-L-S Instr. Corp.
Internat. Devel. & Res.
J-B-T Instruments
Jackson Co., Byron
Kay Electric
Kellogg Switchboard
Knights Co.
Lab. for Electronics
Lampkin Lab.
Lavorie Labs.
Leeds & Northrup
M B Mfg. Co.
Magnetic Instr. Co.
Marconi Instruments
Maxson Instr. Div.
Measurements Corp.
Metron Instr. Co.
Metrotype Corp.
Microwave Assocs., Inc.
Millen Mfg. Co.
Minnesota Electronics
Mohawk Electronics
New London Instr. Co.
Physics Res. Labs.
Polytechnic Res. & Devel.
Potter Aeronautical Co.
Potter Instr. Co.
Probescope Co.
Radiation Instr. Devel.
Radio Frequency Labs.
Ramapo Engrg. Co.
Ramo-Wooldridge
Ransom Research
RCA Div.
Reiner Electronics
Roller-Smith
Rowe Radio Research
Sensitive Res. Instr.
Servo Corp. of Amer.
Shasta Div.
Sheffield Corp.
Shepard Labs.
Sherron Metallic
Simpson Electric
Sound Apparatus Co.
Sperry Gyroscope
Std. Elect. Time Co.
Stewart Instr. Co.
Sunshine Scientific
Taylor Instr. Cos.
Thordarson-Meissner
Triplett Electcl. Instr.
United Optical
Varo Mfg. Co., Inc.
Virginia Electronics
Walkirt Co.
Wang Labs., Inc.
Waugh Engrg. Co.
West Coast Electronics
Wetsberg Mfg. Co.
Westinghouse Electric
Weston Electcl. Instr.
Westport Electric

FREQUENCY INDICATORS, Microwave, including Wavemeters

Amerac, Inc.
Amer. Electroneering
Antenna Research Lab.
Avion Div.
Berkeley Div.
Browning Labs.
Clarke Instr. Corp.
DeMornay-Bonardi
Electro-Tech Equipt. Co.
Electron-Radar Prods.
Electronic Devel. Co.
Farnsworth Electronics
Federal Telephone & Radio
F. R. Mach. Works
GE
General Radio
Gertsch Products
Hewlett-Packard
Hycon Electronics
Jones Electronics
Kay Electric
Kearfott Co.
Lavoie Labs.
Linear Equipt. Labs.
Marconi Instruments
Maxson Corp.
Mico Instr. Co.
Microwave Assocs., Inc.
Millen Mfg. Co.
Narda Corp.
Polarad Electronics
Polytechnic Res. & Devel.
RCA Div.
Ramo-Wooldridge
Simpson Electric
Sperry Gyroscope
Std. Electronic Res.
Sylvania Elect. Prods.
Thompson Products
Vectron, Inc.
WacLine, Inc.
Walkirt Co.

FREQUENCY INDICATORS, Vibrating Reed

Askania-Werke A.G.
Aero Instr. Co.
Biddle Co., James G.
Bronoptics Co.
Browning Labs.
Epic, Inc.
Furst Electronics
J-B-T Insts., Inc.
Sticht Co., Herman H.
Triplett Electcl. Instr.
WacLine, Inc.

FREQUENCY REGULATORS

Allis-Chalmers
Amer. Electronics, Inc.
Avion Div.
Bendix, Eclipse-Pioneer
Bendix, Red Bank
Berkeley Div.
Bogue Electric Mfg.
Burlington Instr. Corp.
C. G. S. Labs.
Collins Radio
Cutler-Hammer
Doelcam Div.
Electric Regulator Corp.
Electronic Spec. Co.
Engineered Magnetics
Fecker, Inc., J. W.
General Controls
GE, Apparatus Sales
GE, Telechron Dept.
General Magnetics, Inc.
Hagan Corp.
Helipot Div.
Howell Instr. Co.
Inet Inc.
Inst. Devel. & Mfg. Corp.
Jackson Co., Byron
Kearfott Co.
Kellogg Switchboard
Leeds & Northrup
Magnetic Amplifiers Inc.
Magnetic Instr. Co.
Magnetic Research Çorp.
Maxson Corp.
Maxson Instr. Div.
Mercury Electronic Co.
Metrotype Corp.
Natl. Aircraft Corp.
Perfex Corp.
Pitometer Log Corp.
Potter Aeronautical Co.
Potter Instr. Co.
Raytheon Mfg.
Riverbank Labs.
Sorensen & Co.
Standard Elect. Time
Stator Electric
Sunshine Scientific
Thordarson-Meissner
Varo Mfg. Co.
Vectron, Inc.
WacLine, Inc.
Westinghouse Electric

FREQUENCY RESPONSE RECORDERS

ACF Electronics
Berkeley Div.
Bristol Co.
Brush Electronics
Davies Labs. Pres.
Edin Co.
Federal Telephone & Radio
Furst Electronics
GE
Industrial Control Co.
Marconi Intsrumetns
Martin-Hubbard
Kay Electric
Panoramic Radio Prods.
Probescope Co.
Servo Corp. of America
Sound Apparatus Co.
Taylor Instr. Cos.
Techno Instr. Co.

FREQUENCY STANDARDS, see Standards, Frequeney

FRITTED GLASS FILTERS and APPARATUS, see Laboratory Apparatus

FUEL ANALYSIS APPARATUS, see Gas Analyzers, also Coal Testers, also Combustion Control, also Boiler Room Instruments

FUEL FLOW INDICATORS, see Flow

FURNACE ATMOSPHERE GENERATORS

GE, Apparatus Sales
Gordon Co., Claud S.
Hevi Duty Electric Co.
L & L Mfg.
Rockwell Co., Wis.
Natural Gas Equipt., Inc.
Pacific Scientific
Surface Combustion Corp.

FURNACE CONTROL SYSTEMS (see also Boiler Room Instruments, also Combustion Safeguards)

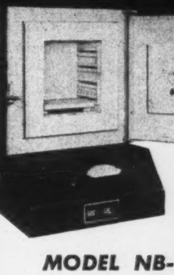
A-P Controls Corp.
Acro Mfg. Co.
Arca Regulators, Inc.
Askania Regl. Co.
Assembly Products
Automatic Electric
Autom. Switch Co.
Autom. Temp. Contr. Co.
Bailey Meter Co.
Barber-Colman
Barnes Co., F. W. & J.
Beck Co.
Blue M. Electric
Bristol Co.
Brooke Engrg. Co.
Burling Instr. Co.
Burrell Corp.
Cash Co., A. W.
Clark Controller Co.
Cleveland Fuel Equipt.
Cook Electric
Cutler-Hammer
Cybertronic Corp.
Dahl & Co., G. W.
Denver Fire Clay Co.
De-Tec-Tronic Corp.
Dickson Co.
Doelcam Div.
Eclipse Fuel Engrg. Co.
Electric Hotpack
Electronic Prod. Co.
Ellison Draft Gage
Englehard, Inc., Chas.
Ess Instr. Co.
Fielden Instr. Div.
Fischer & Porter Co.
Foxboro Co.
Fox Valley Intsr.
Fuel Watchman
Fulton-Sylphon Div.
Furnace Control Sytsems
General Controls Co.
GE, Apparatus Sales
General Regulator Corp.
Gleason-Avery
Gordon Co., Claud S.
Hagan Corp.
Hammel-Dahl
Hays Corp.
High Vacuum Equipt. Corp.
Huppert Co., K. H.
Indust. Control Panel Co.
Jelrus Co.
Larson Instr. Co.
Lake Erie Electric
Leeds & Northrup
Lindberg Air
Marsh Corp. Jas. P.
Mason-Neilan Div.
Mercoid Corp.
Minneapolis-Honeywell
National Airoil Burner
Natural Gas Equipmt., Inc.
Nuclear Res. Corp.
Paragon Electric
Partlow Corp.
Perfex Controls Div.
Pimex, Inc.
Pyrometer Instr. Co.
R-S Prods. Corp.
Reliance Instr. Mfg. Corp.
Republic Flow Meters
Rockwell Co., W. S.
Semimetals, Inc.
Shallcross Controls
Soreng Products
Spence Engrg. Co.
Stator Electric
Surface Combustion Corp.
Taylor Instr. Cos.
Teleflex, Inc.
Thermom. Corp. of Amer.
Thwing-Albert
Tork Clock
United Elect. Controls
West Instr. Corp.
Westinghouse Electric
Weston Electcl. Instr.
Wheelco Instr. Div.
White Mfg. Co.
White-Rodgers
Wilgus Mfg. Co.
Worner Electronic Devices

FURNACES, including Calibrating, Annealing and Laboratory (see also Laboratory Apparatus, also Ovens)

Amer. Gas Furnace Co.
Amer. Instr. Co.
Amer. Research
Baker & Co.
Blue M Electric
Burrell Corp.
Central Scientific
Cooley Elect. Mfg.
Consol. Electrodynamics
  Rochester Div.
Despatch Oven Co.
Dietert Co.
Distillation Products
Doelcam Div.
Eclipse Fuel Engrg.
Electric Hotpack
Ferner Co.
Fisher Scientific
Gallien, R. P.
GE
Gordon Co., Claud S.
Grieve-Hendry
Hevi Duty Electric
High Vacuum Equipt. Corp.
Hoskins Mfg. Co.
Huppert Co.
Jelrus Co.
Johnson Gas Appliance
Kahle Engrg. Co.
L & L Mfg.
Laboratory Equipt. Co.
Leeds & Northrup
Lepel High Freq. Labs.
Litton Industries
Lucifer Furnaces
Machlett & Son
Marshall Co.
Metalab Equipt. Div.
Modern Electrical Lab.
Modern Lab. Equipt. Co.
Pacific Scientific
Pimex, Inc.
Precision Scientific
R-S Prods. Corp.
Research Appliance Co.
Rockwell Co., W. S.
Sargent & Co.
Selas Corp.
Shallcross Controls
Sherr Co., Inc.
Stokes Mach. Co.

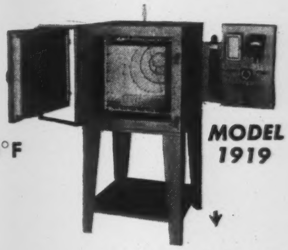
dyna-trol

ELECTRIC FURNACES and OVENS



← MODEL P-79

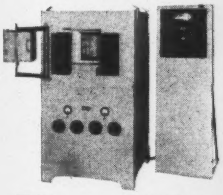
Over 40 Standard Models To 2300°F



MODEL 1919

MODEL NB-1213

Hi Temperature Furnaces To 3000°F



Complete Line To 1000° F. Recirculating Ovens And Protective Atmosphere Furnaces Available.

• WRITE FOR LITERATURE

L&L MANUFACTURING CO.
CHESTER PA.

For more information circle 150 on inquiry card.

Surface Combustion Corp.
Temp. Engrg. Corp.
Tenney Engrg. Co.
Testing Machines Inc.
Thermo Dental Mfg.
Thermo Electric Mfg.
Thwing-Albert
Westinghouse Electric
White Dental Mfg.
Young Bros. Co.

FURNITURE, Laboratory, see Laboratory

FUSE BLOCKS

Aerolite Electronics
Aerovox Corp.
Akron Porcelain Co.
Alden Products
Brit. Electronic Sales
Cinch Mfg. Co.
Continental-Diamond Fibre
Federal Screw Prods.
GE, Apparatus Sales
Insuline Corp. of Amer.
Kulka Electric
Littelfuse, Inc.
Molded Insulation Co.
Pyle-National Co.
R-B-M Manufacturing
Rogan Bros.
Sightmaster Corp.
Stupakoff Div.
Westinghouse Electric

FUSES, Instrument

Alden Products
Automatic Electric
Baker & Co.
Brit. Electronic Sales
Chatham Electronics
Federal Telephone & Radio
GE
Grammes & Sons
Kellogg Switchboard
Littelfuse, Inc.
Meter Devices Co.
Sightmaster Corp.

GAGE BLOCKS, see Dimensional Gages, Mechanical

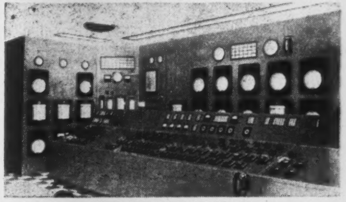
GAGE BLOCKS, Surface Finish, see Dimensional Gages, Mechanical

GAGE COCKS see Valves, Gage Cocks

GAGE GLASS ILLUMINATORS, see Boiler Room Instruments

GAGE GLASS TUBES

Bache & Co., Semon



BAILEY Combustion CONTROL

• Bailey Automatic Combustion Control results in substantial savings in fuel; increased boiler capacity; reduction of boiler and furnace maintenance; more time for operators to devote to general station maintenance; and improvement in the general character of service.

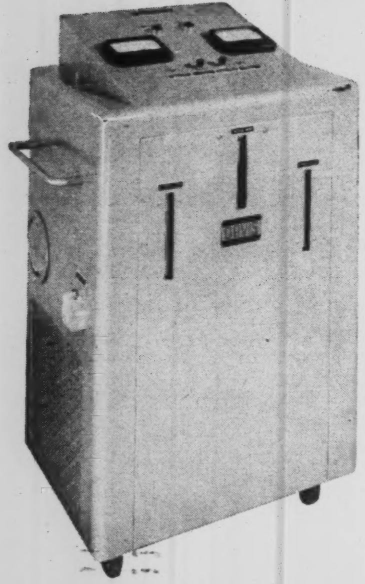
Bailey Automatic Combustion Control makes possible the every day operation of boilers at test efficiencies, because it is a COMPLETE combustion control system which: (1) automatically maintains steam pressure by supplying fuel and air simultaneously to boilers in accordance with changes in steam demand; (2) automatically maintains most economical fuel-air ratio by incorporating the **Bailey Boiler Meter** as an integral part of the system; (3) automatically maintains the desired furnace draft; and (4) automatically distributes load among boilers so that each unit carries its share.

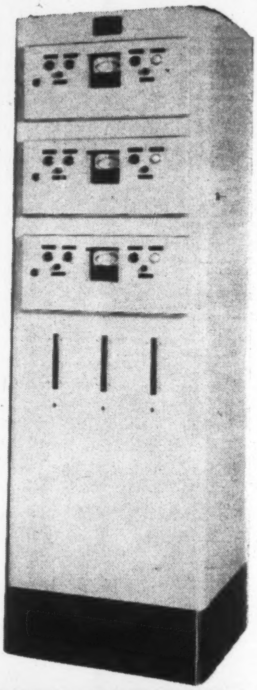
This sturdy, inexpensive, air-operated control system has been applied to all sizes and types of boilers ranging from 200 hp upward. It is applicable to all fuels and all methods of firing.

Request Bulletin 1022 and Bulletin 1023.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For more information circle 151 on inquiry card.





GAS ANALYZERS AND GAS ALARM SYSTEMS

for

1. COMBUSTIBLE GASES AND VAPORS
2. TOXIC GASES IN LOW CONCENTRATIONS
3. GAS PROPORTIONING AND CONTROL
4. OXYGEN ANALYSIS

Specialists in instrumentation utilizing three basic principles:

Catalytic Combustion
Electro-Conductivity
Thermal Conductivity

INSTRUMENT DAVIS DIVISION

DAVIS INSTRUMENTS
A Division of Davis Emergency Equipment Co., Inc.

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For more information circle **152** on inquiry card.

GAGE MOVEMENTS, see Pressure Gage Movements

GAGE TESTERS, Deadweight, see Pressure Instrument Calibrators, Deadweight

GAGE TESTERS, see Manometers

GAGES, see Object of Measurement and Control

GAGES, Adjustable Length, see Dimensional Gages

GAGES, Air, Comparator, see Dimensional Gages

GAGES, Air-gap, see Dimensional Gages

GAGES, Alarm, see Pressure Gages with Alarm

GAGES, Altitude (Boiler), see Boiler Room Instruments

GAGES, Amplifying, see Dimensional Gages

GAGES, Automatic Sorting, see Sorting Equipment

GAGES, Bore, see Dimensional Gages

GAGES, Bourdon, see Pressure Gages

GAGES, Caliper (Dial), see Dimensional Gages

GAGES, Center, see Dimensional Gages

GAGES, Chemical, see Pressure Gages, Chemical

GAGES, Coating Thickness, see Dimensional Gages

GAGES, Comparator, see Dimensional Gages

GAGES, Compression, see Engine Test, also Load, also Weight, also Testing Machines

GAGES, Concentricity, see Dimensional Gages

GAGES, Contour, see Dimensional Gages

GAGES, Cylinder, see Dimensional Gages

GAGES, Dead Weight, see Pressure Instrument Calibrators, Deadweight

GAGES, Depth, Linear, see Dimensional Gages

GAGES, Depth, Navigational, see Depth Gages

GAGES, Differential Pressure, see Pressure, Differential

GAGES, Draft, see Draft Gages

GAGES, Drill Grinding, see Dimensional Gages

GAGES, Feeler, see Dimensional Gages

GAGES, Film Thickness, see Dimensional Gages

GAGES, Gas, see Pressure or Vacuum Gages

GAGES, Height, see Dimensional Gages

GAGES, High Vacuum, see Vacuum Gages

GAGES, Hook, see Surveying Instruments

GAGES, Hydrostatic, see Level Gages, Liquid

GAGES, Internal Dial, see Dimenisonal Gages

GAGES, Ionization, see Radioactivity Detectors

GAGES, Limit, see Dimensional Gages

GAGES, Loss of Head, see Water Works Instruments

GAGES, Mercury, see Manometers

GAGES, Micrometer, see Dimensional Gages

GAGES, Optical, see Dimensional Gages

GAGES, Paint Film, see Dimensional Gages, also Paint

GAGES, Paper Thickness, see Dimensional Gages, also Paper

GAGES, Pipe, see Dimensional Gages

GAGES, Pressure, see Pressure

GAGES, Profile, see Dimensioanl Gages

GAGES, Rain, see Hydrologic Instruments

GAGES, Receiver, see Receiver Indicators

GAGES, Rifle Bore, see Dimensional Gages

GAGES, Ring, see Dimensional Gages

GAGES, Screw Thread, see Dimensional Gages

GAGES, Sliding, see Dimensional Gages

GAGES, Snap, see Dimensional Gages

GAGES, Strain, see Strain Gages

GAGES, Surface Finish, see Dimensional Gages

GAGES, Tank, see Level

GAGES, Telescoping, see Dimensional Gages, also Telescopes

GAGES, Temperature, see Thermometers

GAGES, Thickness, see Dimensional Gages

GAGES, Thickness, Eddy Current, see Thickness Gages

GAGES, Thickness, Magnetic, see Thickness Gages

GAGES, Thickness, Ultrasonic, see Thickness Gages

GAGES, Thread, see Dimensional Gages

GAGES, Tide, see Hydrologic Instruments

GAGES, Tire, see Pressure

GAGES, Torque, see Torque

GAGES, Vacuum, see Vacuum

GAGES, Venturi, see Flowmeters, Inferential

GAGES, Vibration, see Vibration

GAGES, Water Level, see Level

GAGES, Wind, see Meteorological Instruments

GAGES, Wire Measuring, see Dimensional Gages

GALVANOMETER MOVEMENTS

Assembly Products
Bristol Co.
Century Electronics
Century Geophysical
Consol. Electrodynamics
Edin Co.
Electronics, Inc.
G. M. Labs.
GE
Geophysical Instr. Co.
Giannini & Co.
Hathaway Instr. Co.
Illinois Testing Labs.
J-B-T Instruments
Leeds & Northrup
Meters, Inc.
Miller Instr. Co.
Phaostron Co.
Pimex, Inc.
Rubicon Co.
Shallcross Mfg.
Simpson Electric
Stoelting Co.
Technical Instr. Co.
Texas Insts., Inc.
Thwing-Albert
Welch Mfg. Co., W. M.
Winslow Co., Inc.

GALVANOMETERS, AC

Assembly Products
Associated Research
Biddle Co., James G.
Bristol Co.
Brush Electronics
Cambridge Instr. Co.
Central Scientific
Century Geophysical
Consol. Electrodynamics
Dale Instruments
Edin Co., Inc.
Electro-Mechanical Res.
Fielden Instr. Div.
GE
General Radio
Gilman Scientific
G. M. Laboratories, Inc.
Greibach Instr. Co.
Hamilton Watch
Hathaway Instr. Co.
Heiland Division
Hickok Electcl. Instr.
Leeds & Northrup
Miller Insts., Wm.
Metron Instr. Co.
Pfaltz & Bauer
Rawson Electcl. Instr.
RCA Div.
Roller-Smith
Rubicon Co.
Sanborn Co.
Sensitive Res. Instr.
Shallcross Mfg. Co.
Simpson Electric
Technical Instr., Inc.
Texas Insts. Co.
United Optical
Welch Mfg. Co., W. M.
Weston Electcl. Instr.

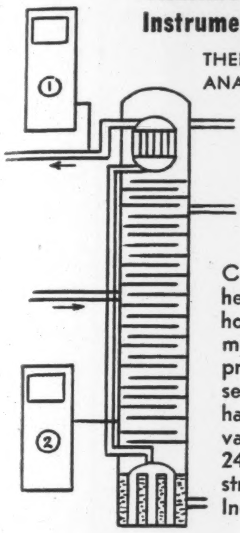
GALVANOMETERS, Astatic

Bristol Co.
Cambridge Instr. Co.
Central Scientific
Chicago App. Co.
Dale Instruments
Geotechnical Corp.
Hamilton Watch
Hathaway Instr. Co.
Leeds & Northrup
Phaostron Co.
Rawson Electcl. Instr.
Ruska Instr. Corp.
Sensitive Res. Insts.
Welch Mfg. Co., W. M.
Westinghouse Electric

GALVANOMETERS, DC

Acton Labs.
Assembly Products
Associated Research, Inc.
B & H Instr. Co.
Borden Engrg. Div.
Bristol Co.
Brush Electronics
Cambridge Instr. Co.
Central Scientific
Century Geophysical
Clevite Res. Center
Coleman Instr. & Mfg.
Consol. Electrodynamics
Dale Instruments
DeJur-Amsco
Doelcam Div.
Edin Co., Inc.
Edison Inc., Thomas A.
Electric Des. & Engrg.
Electro-Mechanical Res. Co.
Electronic Devel. Lab.
Engelhard, Chas., Inc.
Federal Telephone & Radio
Fielden Instr. Div.
G. M. Labs.
GE, Apparatus Sales
GE, Instr. Dept.
Geotechnical Corp.
Gilman Scientific
Gray Instr. Co.
Greibach Instruments
Hamilton Watch
Hathaway Instr. Co.
Heiland Div.
Hickok Electcl. Instr.
Hormell Instr. Co.
Industrial Control Co.
J-B-T Instruments
Jarrell-Ash
Leeds & Northrup
Marion Electcl. Instr.
Meters, Inc.
Metron Instrument Co.
Mil Instr. Corp.
Miller Insts, Wm.
Minneapolis-Honeywell
Phoenix Prec. Instr.
Photron Instr. Co.
Physics Res. Labs.
Pimex, Inc.
Pyrometer Instr. Co.
RCA Div.
Rawson Electcl. Instr.
Roller-Smith
Rubicon Co.
Sanborn Co.
Scientific Specialties
Sendur Mfg. Co.
Sensitive Res. Instr.
Shallcross Mfg.
Simpson Electric
Southw. Ind. Electronics
Technical Instruments
Technology Instr. Div.
Texas Insts., Inc.
Thwing-Albert
Triplett Elect. Instr.
United Optical
Welch Mfg. Co., W. M.
WacLine, Inc.

Thermco Analyzers for CHEMICAL PROCESS CONTROL



THERMCO IS READY to Instrument Gas Processes For You!

THERMCO HAS SUPPLIED IMPROVED ANALYZERS FOR THE FOLLOWING:

- Air Rectification
- Nitrogen Purification
- Argon Purification
- Chlorine Production
- Hydrogen Production
- Ammonia Production

Control by gas analysis may help you. By Thermco's know-how, gas analyzers have been made more practical by improved reliability, time lags and sensitivities. Thermco analyzers have full control over mixing valves in processes operating 24 hours a day. Complete instrument panels are available. Inquiries are welcome.

JOHNSON ROAD
MICHIGAN CITY, INDIANA

THERMCO
LABORATORIES

For more information circle **153** on inquiry card.

Westinghouse Electric
Weston Electcl. Instr.
Winslow Co.

GALVANOMETERS, Miscellaneous, including Magnetostriction and Piezoelectric

Central Scientific
Edin Co., Inc.
Gulton Mfg. Co.
Hamilton Watch
Magnetic Industries
Rubicon Co.
Anatron Engrg. Corp.

GALVANOMETERS, Reflecting

Associated Research
B & H Instr. Co.
Berndt-Bach
Brush Electronics
Cambridge Instr. Co.
Century Electronics & Insts.
Century Geophysical
Coleman Instruments
Consol. Electrodynamics
Edin Co., Inc.
Epic, Inc.
Ercona Corp.
Federal Telephone & Radio
GE, Apparatus Sales
Geotechnical Corp.
Gilman Scientific Instr.
G-M Labs.
Hamilton Watch
Hathaway Instr. Co.
Heiland Div.
Hormell Instr. Co.
Jarrell-Ash
Leeds & Northrup
Magnetic Industries
Midwestern Instr. Co.
Pancro Mirrors, Inc.
Pfaltz & Bauer
Phoenix Prec. Instr.
Physics Research Labs.
Pimex, Inc.
Rawson Electcl. Instr.
Rubicon Co.
Sanborn Co.
Shallcross Mfg. Co.
Southw. Ind. Electronics
Sprengnether Instr. Co.
Technical Instruments Co.
Texas Insts., Inc.
Thwing-Albert
United Optical
Welch Mfg. Co., W. M.

GALVANOMETERS, Suspension Strip

Berndt-Bach
Century Electronics & Insts.
Consol. Electrodynamics
GE, Apparatus Sales
Geotechnical Corp.
Howell Instr. Co.
Pimex, Inc.
Rawson Electcl. Instr.
Shallcross Mfg.
Technical Instr. Co.
Welch Mfg. Co., W. M.

GALVANOMETERS, Vacuum-tube

Acton Labs.
Associated Research
Beckman Div.
Bristol Co.
Doelcam Div.
Electronic Devel. Lab.
Electro Prods. Lab.
Engineering Labs.
General Radio
Hamilton Watch
Harvey Radio Labs.
Hathaway Instr. Co.
Heiland Div.
Industrial Control Co.
Internat. Std. Trading
MacDonald Co., W. S.
Measurements Corp.
Millivac Instruments
RCA Div.
Rockwell Engrg. Co.
Sanborn Co.
Shallcross Mfg.
Varo Mfg. Co.
Weston Electcl. Instr.

GALVANOMETERS, Vibration

Cambridge Instr. Co.
Century Geophysical
Consol. Electrodynamics
Epic, Inc.
Gilman Scient. Instr.
Hamilton Watch
Hathaway Instr. Co.
Heiland Div.
Leeds & Northrup
Miller Insts., William

GALVANOSCOPES

Central Scientific
Jarrell-Ash
Stoelting Co.
Welch Mfg. Co., W. M.

GAS ANALYZERS, Air

Allied Engrg. Div.
Atmosphere Control
Baker & Co.
Beckman Div.
Bendix-Friez
Bristol Engrg. Corp.
Burrell Corp.
Cambridge Instr. Co.
Central Scientific
Consol. Electrodynamics
Cook Electric
Curtiss-Wright
Davis Emergency Equipt.
Engelhard, Inc., Chas.
Fish-Schurman
Fisher Scientific
GE, Apparatus Sales
Gow-Mac Instr. Co.
Greiner Glassblowing Lab.
Hays Corp.
Hebler Co.
Johnson-Williams
Jordan Electronic Mfg.
Mercoid Corp.
Mine Safety Appliances
Perkin-Elmer
Permutit Co.
Process & Instruments
Refinery Supply Co.
Sargent & Co.
Scientific Glass App.
Staplex Co.
Taller & Cooper
Thermco Labs.
Victory Engrg. Corp.
Weston Electcl. Instr.
Willson Products

GAS ANALYZERS, Ammonia

Applied Physics Corp.
Baird Assocs.-Atomic Instr.
Baker & Co.
Beckman Inc., Arnold O.
Burrell Corp.
Consol. Electrodynamics
Davis Insts. Div.
Engelhard, Chas., Inc.
GE
Gow-Mac Instr. Co.
Hallikainen Instruments
Hays Corp.
Hebler Co.
Johnson-Williams
Kaye Devel. Co.
Mercoid Corp.
Mine Safety Appliances
Mira Scient. Insts.
Perkin-Elmer
Permutit Co.
Process & Instruments
Sargent & Co.
Taller & Cooper
Thermco Labs.
Victory Engrg. Corp.
Weston Electcl. Instr.

GAS ANALYZERS, Carbon Dioxide and/or Carbon Monoxide (see also Boiler Room Instruments, also Combustion)

Ace Glass, Inc.
Allied Engrg. Div.
Amer. Electronic Labs.
Amer. Electronics
Applied Physics Corp.
Atmosphere Control
Bacharach Indust. Instr.
Bailey Meter Co.
Baird Assocs.-Atomic Instr.
Baker & Co.
Beckman Div.
Beckman, Inc., Arnold O.
Bendix-Friez
Bristol Co.
Bristol Engrg. Corp.
Bullard Co.
Burrell Corp.
Cambridge Instr. Co.
Central Scientific
Chicago Apparatus Co.
Cities Service Oil Co.
Cleveland Fuel Equipt.
Curtiss-Wright Corp.
Davis Emergency Equipt.
Davis Insts. Div.
Daytronic Corp.
Detectolab, Inc.
Diatron Co.
Dwyer Mfg. Co.
Eclipse Aviation
Electric Heat Control
Electron Radar Prods.
Ellison Draft Gage
Engelhard, Chas., Inc.
Engineering Labs, Inc.
Fish-Schurman
Fisher Scientific
Foxboro Co.
GE
Gordon Co., Claud S.
Gow-Mac Instr. Co.
Greiner Glassblowing Lab.
Hallikainen Instruments
Hays Corp.
Hebler Co.
Instrument Engrg. Serv.
Johnson-Williams
Jordan Electron Mfg. Co.
Kaye Devel. Co.
Kontes Glass
Laboratory Equipt. Co.
Leeds & Northrup
Machlett & Son
Mine Safety Appliances
Mira Scient. Insts.
Panellit, Inc.
Perkin-Elmer
Permutit Co.
Phipps & Bird
Podbielniak, Inc.
Potter Co.
Prec. Thermom. & Insts.
Preferred Utilities Mfg.
Process & Instruments
Raytheon Mfg.
Refinery Supply Co.
Republic Flow Meters
Sargent & Co.
Scam Instr. Corp.
Schauer Mfg. Corp.
Scientific Glass App.
Scientific Instr. Co.
Sorvall Inc., Ivan
Sun Electric Corp.
Taller & Cooper
Testing Machines, Inc.
Thermco Laboratories
Tigerman Engrg. Co.
Uehling Instr. Co.
Victory Engrg. Corp.
Viking Instruments
Will Corp.
Williams App. Co.

GAS ANALYZERS, Flue Gas, see Gas Analyzers, CO, O_2, etc.

GAS ANALYZERS, Hydrogen, Hydrogen Sulphide, Nitric Oxide, etc.

Allied Engrg. Div.
Amer. Electronics
American Meter
Applied Physics Corp.
Atmosphere Control
Bacharach Indust. Instr.
Bailey Meter Co.
Baird Assocs.-Atomic Instr.
Baker & Co.
Beckman Div.
Beckman, Inc., Arnold O.
Bristol Co.
Bristol Engrg. Corp.
Bullard Co.
Burrell Corp.
Cambridge Instr. Co.
Central Scientific
Chicago App. Co.
Cities Service Oil Co.
Connelly Co.
Consol. Electrodynamics
Davis Insts. Div.
Daytronic Corp.
Diatron Co.
Distillation Products
Electrical Dev.
Electron Radar Prods.
Engelhard, Chas., Inc.
Fisher Scientific
Foxboro Co.
GE, Apparatus Sales
Gow-Mac Instr. Co.
Greiner Glassblowing Lab.
Kontes Glass
Hallikainen Instruments
Hays Corp.
Hebler Co.
Heiland Div.
Industrial Insts., Inc.
Instrument Devel. Labs.
Instrument Engrg. Serv.
Jarrell-Ash
Johnson-Williams
Kahn & Co.
Kaye Devel. Co.
Kruger Insts., Harold
Leeds & Northrup
Mine Safety Appliances
Mira Scient. Insts.
North Amer. Philips
Perkin-Elmer
Permutit Co.
Phoenix Prec. Instr.
Podbielniak, Inc.
Precision Scientific
Raytheon Mfg. Co.

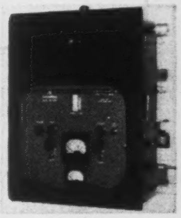
SYNONYMOUS WITH SAFETY

J-W COMBUSTIBLE GAS INDICATORS AND ALARMS

For continuous multi- or single-point protection in areas where gas danger is always present, investigate these modern, reliable J-W models.

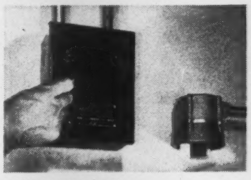
J-W Model RV Alarms

Sample and analyze air from 2 to 8 separate locations in sequence on a 30-second cycle. Recording instruments and explosion-proof construction are available on special order.



J-W Model SM Alarm

Continuously samples from one location. Indicates quantity of combustible gas present. Alarms at a pre-set level.



J-W Model E Alarm

Inexpensive instrument for detecting explosive gases in a single area. Control box mounts remote from sensing unit. Model EE also available with both detecting and indicating elements encased in an explosion-proof housing permitting installation of entire instrument in a hazardous or outdoor location.

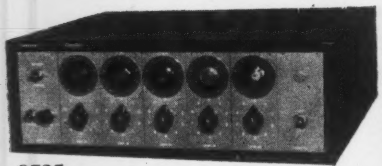
J-W

For detailed data on these models and portable and custom-built J-W instruments and accessory equipment, contact the makers of top quality products for over 25 years:

JOHNSON-WILLIAMS, INC.
Palo Alto 11, California

Canadian customers, please write:
SAFETY SUPPLY CO.
Toronto, Ontario

For more information circle **154** on inquiry card.



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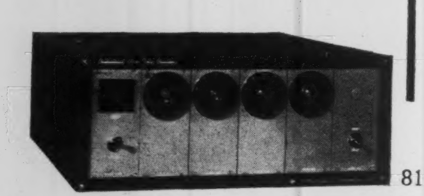


8174

BAIRD ATOMIC

Industrial Counting and Control Equipment

Components and complete systems — offering time-tested accuracy and performance reliability.

Totalizers — automatic counting to 10 digit capacity, by units, dozens or gross, with speeds to 20,000 cps. Unitized plug-in strips permit "building-block" construction of custom equipment at standard production model prices.

Pre-set Counters — single and dual — activate production operations at pre-selected count. Supplementary components include: locking or momentary relays, batching registers, pulse or contact inputs.

For further information, write for special bulletin.

BAIRD ATOMIC *Baird Associates—Atomic Instrument Co.*
33 UNIVERSITY ROAD, CAMBRIDGE 38, MASSACHUSETTS

For more information circle **155** on inquiry card.

Instrument Engrg. Serv.
Jordan Electronic Mfg.
Laboratory Equipt. Corp.
Leeds & Northrup
Mine Safety Appliances
Mira Scientific Insts.
Moore Co., H. R.
Phipps & Bird
Podbielniak, Inc.
Precision Scientific
Process & Instruments
Sargent & Co.
Scientific Glass App.
Scientific Instr. Co.
Superior Meter Co.
Taller & Cooper
Thermco Labs.
Universal Aviation
Victory Engrg. Co.
Weston Electcl. Instr.

GAS ANALYZERS, Nitrogen

Ace Glass Inc.
Aloe Co., A. S.
Amer. Electronics, Inc.
Baker & Co.
Beckman Div.
Beckman, Inc., Arnold O.
Boekel & Co.
Burrell Corp.
Bush Assocs.
Central Scientific
Chicago Apparatus Co.
Fisher Scientific
Gow-Mac Instr. Co.
Greiner Glassblowing Lab.
Hays Corp.
Laboratory Construction
Laboratory Equipt. Corp.
Microchemical Service
Mine Safety Appliances
Podbielniak, Inc.
Precision Scientific
Rubicon Co.
Sargent & Co.
Scientific Glass App.
Taller & Cooper
Taylor & Co., W. A.
Weston Electcl. Instr.

GAS ANALYZERS, Sulphur Dioxide

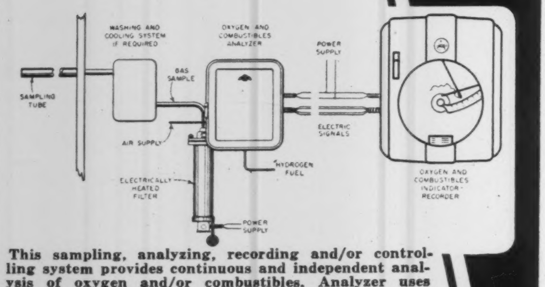
Ace Glass Inc.
Allied Engrg. Div.
Amer. Electronics, Inc.
Applied Physics Corp.
Atmosphere Control
Bacharach Indust. Instr.
Baird Assocs.-Atomic Instr.
Baker & Co.
Beckman, Inc., Arnold O.
Beckman Div.
Burrell Corp.
Cambridge Instr. Co.
Consol. Electrodynamics
Davis Instr. Div.
Engelhard, Chas., Inc.

Fish-Schurman
Foxboro Co.
Gow-Mac Instr. Co.
Greiner Glassblowing Lab.
Hays Corp.
Instrument Engrg. Serv.
Kontes Glass
Kruger Insts., Harold
Laboratory Equipt. Co.
Leeds & Northrup
Mine Safety Appliances
Mira Scientific Insts.
Perkin-Elmer
Precision Scientific
Sargent & Co.
Scientific Glass App.
Taller & Cooper
Technical Equipt. Co.
Thermco Labs.
Uehling Instr. Co.
Victory Engrg. Co.

GAS DENSITY METERS, see Density

GAS DISTRIBUTION SYSTEM INSTRUMENTS, including Gas Station Meters, Pipe Line Instrumentation, Pressure Regulators, Station Instrumentation, etc.

Amer. Meter Co.
B-I-F Industries
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bendix-Pacific
Black, Sivalls & Bryson
Bowser & Co.
Bristol Co.
Brooks Rotameter
Cash Valve Mfg. Corp.
Century Electronics Insts.
Climax Div.
Cutler-Hammer
Fisher Governor
Foster Engrg. Co.
General Controls
Hagan Corp.
Hammel-Dahl
Industrial Instr. Co.
Librascope, Inc.
Linde Air Products
Manning, Maxwell & Moore
Mason-Neilan Div.
Minneapolis-Honeywell
  Indust. Div.
Natural Gas Equipt. Co.
Penn Insts. Div.
R.K.L. Mfg. Co.
Rawson Electcl. Instr.
Republic Flow Meters
Research Controls
Rockwell Mfg. Co.
Scientific Instr. Co.
Smith Corp., A. O.
Sparton Cont. Systems



WASHING AND COOLING SYSTEM IF REQUIRED
OXYGEN AND COMBUSTIBLES ANALYZER
POWER SUPPLY
GAS SAMPLE
SAMPLING TUBE
AIR SUPPLY
ELECTRIC SIGNALS
HYDROGEN FUEL
ELECTRICALLY HEATED FILTER
OXYGEN AND COMBUSTIBLES INDICATOR-RECORDER
POWER SUPPLY

GAS ANALYZERS

BAILEY METERS

for Oxygen & Combustibles Content of Gases

This sampling, analyzing, recording and/or controlling system provides continuous and independent analysis of oxygen and/or combustibles. Analyzer uses hydrogen and/or air for catalytic combustion of sample. Minimum range: 0-5%; maximum range: 0-25%.

Ideal combustion guide and safety device for furnaces, kilns, and heaters. Analyzes and controls output from atmosphere generators.

Request Product Specification:

E65-1 for O_2 and Comb. Analyzer
E65-2 for O_2 Analyzer
E65-3 for Comb. Analyzer
E65-5 for HEAT PROVER
HEAT PROVER: Portable Combustion Analyzer

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND 10, OHIO

For more information circle **156** on inquiry card.

Rubicon Co.
Sargent & Co.
Scam Instr. Corp.
Scientific Glass App.
Sunshine Scientific
Taller & Cooper
Thermco Labs.
Tigerman Engrg. Co.
Victory Engrg. Corp.
Viking Instruments
Willson Prods., Inc.
Zeiss, Inc., Carl

GAS ANALYZERS, Orsat

Ace Glass, Inc.
Allied Engrg. Div.
Amer. Electronics, Inc.
Atmosphere Control
Bacharach Indust. Instr.
Bailey Meter Co.
Baker & Co., Inc.
Burrell Corp.
Central Scientific
Chicago App. Co.
Dwyer Mfg. Co.
Ellison Draft Gage
Fish-Schurman
Fisher Scientific
Greiner Glassblowing Lab.
Hays Corp.
Howe & French
Laboratory Equipt. Corp.
Machlett & Son
Podbielniak, Inc.
Prec. Thermom. & Insts.
Quality Electric
Sargent & Co.
Scientific Glass App.
Specialty Glass Co.
Taller & Cooper

GAS ANALYZERS, Oxygen

Allied Engrg. Div.
Amer. Electronics, Inc.
Amer. Instr. Co.
Atmosphere Control
Bacharach Indust. Instr.
Bailey Meter Co.
Baker & Co.
Beckman Div.
Beckman, Inc., Arnold O.
Burrell Corp.
Bush Assocs.
Cambridge Instr. Co.
Central Scientific
Chicago Apparatus Co.
Consol. Electrodynamics
Davis Instr. Div.
Dorber Co.
Ellison Draft Gage
Engelhard, Chas., Inc.
Foxboro Co.
Gadgets, Inc.
GE
Gow-Mac Instr. Co.
Greiner Glassblowing Lab.
Hays Corp.

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FINE PITCH PRECISION GEARS TO YOUR SPECIFICATIONS
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CHICAGO 18, Ill.

For more information circle **157** on inquiry card.

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Southw. Ind. Electronics
Std. Elect. Time Co.
Surface Combustion Corp.
Tracerlab Inc.
Weksler Thermom. Corp.

GAS LEAK INDICATORS, see Leak

GAS METERS, see Flowmeters

GAS METERS, Positive, see Flowmeters, Positive Displacement

GAS and VAPOR DISCHARGE TUBES, see Tubes, Discharge

GASKETS, including Cork, Felt, Fibre, Leather, Metal, Oil Proof, Rubber

Acushnet Process Co.
Aerolite Electronics
Allegheny Plastics
Allied Engraving
Amer. Felt Co.
Amer. Hard Rubber Co.
Armstrong Cork Co.
Atlantic India Rubber
Auburn Mfg. Co.
Autom. & Prec. Mfg.
Belmont Smltg. & Refg.
Biggs Co., Carl H.
Blossom Mfg. Co.
Brady Co.
Canfield Rubber Co.
Chase Brass Copper
Chicago Cork Wks.
Chicago Rawhide Mfg.
Coaxial Connector Co.
Continental-Diamond
Continental Rubber Wks.
Crane Packing Co.
Darcoid Co.
Detroit Gasket & Mfg.
Division Lead Co.
Electronic Mechanics
Felt Products Mfg.
Formica Co.
Garlock Packing Co.
GE
General Tire
Goodrich Co., B. F.
Goodyear Tire
Goshen Rubber
Grammes & Sons
Graton & Knight
Hamilton Rubber Mfg.
Hathaway Instr. Co.
Hi-Grade Alloy Corp.
Insulation Mfrs. Corp.
adow Inc.
Kiefer Tanning Co.
LeRoy Maugans Co.
Marston Co.
Mechanical Leather Co.
Mica Insulator
Michigan Leather Prods.
Minnesota Mining Mfg.
Moss & Co.
Natl. Vulcan Fibre Co.
Parker Appliance Co.
Printloid, Inc.
Polymer Corp.
Products Res. Co.
Raybestos-Manhattan
Republic Rubber Div.
Resistoflex Co.
Reynolds Gas Reg. Co.
Rhodes & Co.
Richardson Co.
Rubatex Div.
Sillcocks-Miller
Spaulding Fibre Co.
Stokes Molded Prods.
U. S. Gasket Co.
U. S. Rubber Co.
Waldon Electronics
Webber Bros. Metal Wks.
Western Rubber Co.
Whitehead Stamping Co.
Wilmington Fibre

GASOLINE MILEAGE TESTERS, see Mileage Indicators

GAUGES, see Gages

GAUSSMETERS, see Magnetic Field Strength

GEAR ASSEMBLIES, see Gears, Precision

GEAR DEVICES, Water Meter and Register

Alina Corp.
Bakelite Corp.
Gear Supply Co.
Instru-Lec Corp.
Instrument Gear Wks.
Mass. Gear & Tool
Merkle Korff Gear Co.
North Amer. Philips
Plumb Co., D. S.
Precision Mfg. Co.
Preco Co.

GEAR SEGMENTS, see Gears

GEAR TEST INSTRUMENTS (see also Dimensional Gages)

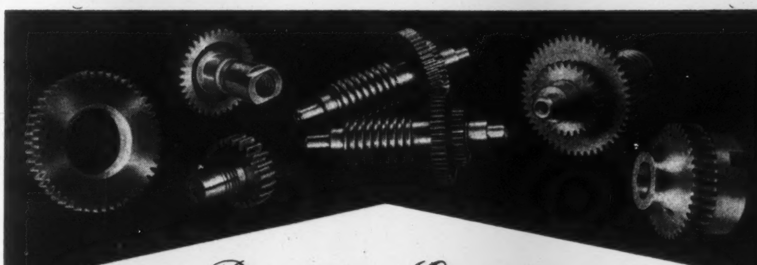
Airborne Instruments
Brown & Sharpe
Brush Electronics
Dillon & Co.
Eitzen Co., Louis E.
Engineering Res. & Devel.
Ercona Corp.
Erdco Engrg. Co.
Ferner Co.
Fellows Gear Shaper
Industrial Electronics
Jerpbak-Bayless
Krouse Testing Machs.
Michigan Tool Co.
Micrometrical Mfg.
Morse Twist Drill
National Broach & Machine
Olsen Testing Mach.
Optical Gaging Prods.
Orban Co., Kurt
PIC Design Corp.
Scherr Co.
Simpson Electric
Size Control Co.
Van Keuren Co.
Vinco Corp.
Virginia Electronics

GEARS, Precision, including Gear Trains, Gear Hubs, Pinions, etc.

Abart Gear & Mach. Co.
Aeromarine Instr. Co.
Ahrendt Instr. Co.
Alina Corp.
Allied Products Div.
Amer. Laubscher Corp.
Asam Mfg. Co.
Bayside Watch Tool
Beaver Gear Works
Bellmore Gear
Beryllium Corp.
Bodine Electric Co.
Bowmar Instr. Corp.
Burton Mfg. Co.
Chelsea Clock
Cincinnati Time Rec. Co.
Cramer Controls Corp.
Daystrom Instrument
Dexter Machine Prods.
Dynamic Gear Co.
Elec. Tachometer Corp.
El Ray Motor Co.
Empire State Labs.
Erwood, Inc.
Fecker, Inc.
Ferner Co.
Ford Instr. Co.
Gallien, R. P.
Gear Supply Co.
GE, Plastics Dept.
General Industries, Inc.
Globe Industries, Inc.
Gorton Machine Co.
Grant Gear Works
Greaves Mach. Tool
Gries Reproducer Corp.
Hall-Barkan
Hamilton Tool Co.
Hamilton Watch
Hartford Spec. Mach. Co.
Haydon Mfg. Co., Inc.
Heitz, Karl, Inc.
Helipot Div.
Howard Clock
Indiana Gear Works
Ingersoll-Waterbury
Insco Company
Instr. Devel. & Mfg. Corp.
Instru-Lec Corp.
Instrument Gear Works
Jeffrey Mfg. Co.
Jensen Tool Co.
Kearfott Co.
Kurman Electronics
Librascope, Inc.
Link Aviation
Lux Clock
Macnick Co.
Mass. Gear & Tool Co.
Merkle Korff Gear Co.
Mico Instr. Co.
Micron Gear Mfg.
Miller Instr. Co., Wm.
Modern Tech. Supply
National Time & Signal
New Haven Clock
Norden-Ketay
Oster Mfg. Co., John
Peck Spring
Perkins Mach. & Gear Co.
Phila. Gear Works, Inc.
PIC Design Corp.
Plumb Co., Inc.
Powdered Metal Prods.
Pratt & Whitney
Precision Mfg. Co.
Precision Tube Co.
Preco Co.
RCA
Reeves Instr. Corp.
Res. Devel. Manufacture
Richardson Co.
Scherr Co.
Servomechanisms, Inc.
Seth Thomas Div.
Shakeproof, Inc.
Smith Machine Co.
Spaulding Fibre Co.
Specialty Screw Mach.
Sphinx American Co.
Steel Co., Herman D.
Sterling Precision Corp.
Sterling Prec. Instr. Co.
Swiss Amer. Jewel-Bearings
Swissmatic Products
Thomas Clock
Thompson Clock Co.
Triplex Machine Tool
Vallorbs Jewel Co.
Western Gear Corp.
Wilder, Inc.
Winzeler Mfg. & Tool Co.

GEIGER-MUELLER COUNTERS, see Radioactivity

GEIGER-MUELLER TUBES, see Tubes, Geiger Mueller



Precision Gearing

★ WORMS
★ SPUR GEARS
★ WORM GEARS
★ RACKS
★ SPIRAL GEARS
★ HELICAL GEARS

We specialize in the manufacturing of fine pitch gears of the types widely used in the electronics and instrumentation fields, cut to the close tolerances demanded by modern advanced engineering. We are equipped to produce these items either complete or on a "cutting only" basis, in pitches as fine as 200, from the minute sizes up to 8" dia. Meticulous testing procedures and equipment are used for precision quality control, and we will furnish Fellow's Red Liner Charts with finished gears on request, offering graphic proof of our accuracy.

US GEAR

U. S. GEAR CORPORATION
Dept. T · 71 BROADWAY · WAKEFIELD, MASS.

For more information circle **158** on inquiry card.

GENERATORS, AC

AiResearch Mfg. Co.
Amer. Electronics
Avion Div.
Bekey Electric
Bendix, Eclipse-Pioneer
Bendix-Friez
Bendix, Red Bank
Bogue Electric Mfg.
Columbia Electric Mfg.
Cyclohm Div.
D & R, Ltd.
Dalmotor Co.
Donner Scientific
Eastern Air Devices
Eicor, Inc.
Electric Indicator Co.
Electric Spec. Co.
Electro Engrg. Prods. Co.
Electro Mechano
Electronic Instr. Co.
El Ray Motor Co.
Fairbanks, Morse & Co.
GE, Apparatus Sales
Geophysical Instrument
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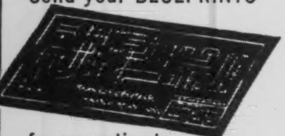

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Electric Indicator Co.
Electric Spec. Co.
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Electro Mechano
Electronic Instr. Co.
Electronic Res. Assocs.
El Ray Motor Co.
Esterline-Angus
Fairbanks, Morse & Co.
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Georator Corp.
Globe Industries, Inc.
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Inet Div.
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Interelectronics Corp.
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Lear Inc.
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Magnetic Instr. Co.
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Amer. Electroneering
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Authorized Mfrs. Service
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Cyclohm Div.
D & R Limited
Dalmotor Co.
Donner Scientific
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Electronic Instr. Co.
Electronic Measmts. Co.
Espey Mfg.
F. R. Machine Works
Farnsworth Electronics
Federal Telephone & Radio
Ferris Instr. Co.
GE, Electronics Div.
General Radio
General Test Equipt.
Harvey Radio Labs.
Hewlett-Packard
Hickok Electcl. Instr.
Hycon Electronics
Indust. Test Equipt. Co.
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Jackson Co., Byron
Jackson Electcl. Instr.
Kahn & Co.
Kay Electric
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Fisher Res. Lab.
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Geotechnical Corp.
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Instr. Devel. Labs.
Interelectronics Corp.
Jarrell-Ash
Kay Electric
M B Mfg. Co.
Martin-Hubbard
Massa Labs.
Menlo Research Lab.
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Mico Instr. Co.
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Mt. Sopris Instr. Co.
National Co., Inc.
Nuclear Research Corp.
Penn Optical & Instr.
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Radiation Counter Labs.
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Southw. Ind. Electronics
Sprengnether Instr. Co.
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Res. Specialties Co.
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Bristol Co.
Buhl Optical
Can. Rad. & Uran. Corp.
Cast Optics
Chicago Dial Co.
Corning Glass Works
Crystal Glass Tube & Cyl.
Dearborn Glass Co.
Dearborn Scientific
Eclipse Glass Co.
Edna Lite Co.
Engis Equipt. Co.
Esco Prods. Co.
Farrand Optical
Ferner Co.
Fish-Schurman
Fosdick Glass Co.
Freed, J. Melvin
G. R. S. Corp.
Geophysical Instr. Co.
Glass Insts., Inc.
Glass Products Co.
Glendale Optical
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Greiner Glassblowing Lab.
Gurley, W. & L. E.
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Hayward Scient. Glass
Horning, August W.
Inlaid Optical
International Optical
Johnston Glass Co.
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Lab. Optical Co.
Lancaster Lens Co.
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Lynn, Robert M.
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Polaroid Co.
Practo Photo Acces.
Prec. Glass Prods.
Prec. Prods. Co.
Regal Instr. Co.
Schneider-Cogswell
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Steel Co., Herman
Technical Soldering Co.
Torrance Glass & Color
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United Lens Co.
Valley-National Corp.
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Zenith Optical Lab.

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Bache & Company, Semon
Bausch & Lomb Optical
Behm & Sons
Brazilian Trading Co.
Buhl Optical
Cast Optics
Corning Glass Works
Dearborn Glass Co.
Edna Lite Co.
Enteco Industries, Inc.
Esco Prods. Co.
Fish-Schurman
Freed, J. Melvin
Glass Insts., Inc.
Glendale Optical
Hayward Scientific
Inlaid Optical
Internat. Optical
Jaegers, A.
Lab. Optical Co.
Lancaster Lens Co.
Leroy Clausing Co.
Lynn, Robert M.
Marsco Mfg. Co.
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Dearborn Glass Co.
Ednal Co.
General Chemical Div.
Harshaw Chemical Co.
Industrial R. & T. Labs.
Marsco Mfg. Co.
Teichert Engrg. Co.
Torrance Glass & Color
Westinghouse Electric

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Amer. Optical
Bache & Company, Semon
Bausch & Lomb
Behm & Sons
Buhl Optical Co.
Chicago Dial Co.
Corning Glass Works
Crystal Glass Tube
Dearborn Glass Co.
Eastman Kodak Co.
Eclipse Glass Co.
Edna Lite Co.
Esco Products
Fish-Schurman
Fisher & Porter Co.
Greiner Glassblowing Lab.
Haward Scientific
Herron Optical
International Optical
Jaegers, A.
Lancaster Lens Co.
Lynn, Robert M.
Mann Co., Wm. I.
Marsco Mfg. Co.
Paloe Optical
Practo Photo Acces. Corp.
Regal Instr. Co.
Schneider-Cogswell, Inc.
Scientific Instr. Co.
Simpson Optical
Torrance Glass & Color
United Lens Co.
Universal Blank Corp.
Zenith Optical Co.

GLASS, Infrared Transmitting

Alfa Amer. Corp.
Amer. Optical Co.
Bache & Company, Semon
Behm & Sons
Bronoptics Co.
Cast Optics
Corning Glass Works
Dearborn Glass Co.
Eastman Kodak Co.
Edna Lite Co.
Enteco Industries, Inc.
Esco Products
Farrand Optical
Fish-Schurman
Harshaw Chemical
Hayward Scientific
Houston Technical Labs.
International Optical
Lab. Optical Co.
Lancaster Lens Co.
Lynn, Robert M.
Mann Co., Wm. I.
Marsco Mfg. Co.
Meyer Opticraft
Phoenix Prec. Instr.
Polaroid Corp.
Practo Photo Access. Corp.
Regal Instr. Co.
Rohm & Haas
Servo Corp. of Amer.
Simpson Optical
Torrance Glass & Color
Zenith Optical Lab.

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Bache & Company, Semon
Bausch & Lomb
Behm & Sons
Boehmke Optical
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Buhl Optical
Burke & James
Can. Rad. & Uran. Co.
Chicago Dial Co.
Corning Glass Wks.
Crystal Research Labs.
Dearborn Glass Co.
Dearborn Scientific
Distillation Products
Dome Precision Corp.
Eclipse Glass Co.
E & S Optical
Edmund Scientific
Edna Lite Co.
Esco Products
Fish-Schurman
Fischer & Porter Co.
Gaertner Scientific
Gurley, W. & L. E.
International Devel. Co.
International Optical
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Keim Prec. Mirrors
Lancaster Lens Co.
Leroy Clausing Co.
Lynn, Robert M.
Mann Co., W. I.
Marsco Mfg. Co.
Metavac Inc.
Micromat Co.
Miller Instr. Co.
National Research Corp.
Optical Coating Lab.
Optical Film Engrg. Co.
Pacific Optical
Pacific Univ. Prods.
Palos Optical
Pancro Mirrors, Inc.
Penberthy Instr. Co.
Phoenix Prec. Instr.
Plummer & Kershaw
Practo Photo
Regal Instrument Co.
Renick Co., L. C.
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Simpson Optical
Tinsley Labs.
Torrance Glass & Color
Unertl Optical
Univis Lens Co.
Zenith Optical Co.
Zenith Optical Lab.

GLASS, Photosensitive

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Bush Assocs.
Corning Glass Works
Fish-Schurman
H. & O. Co.
Internat. Glass Corp.
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Bausch & Lomb
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Eastman Kodak Co.
Edna Lite Co.
Esco Products
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Marsco Mfg. Co.
Palos Optical
Regal Instr. Co.
Torrance Glass & Color
United Lens Co.
Universal Blank Corp.
Zenith Optical Lab.
Zoomar Corp.

GLASS, Photosensitive

Behm & Sons
Bush Assocs.
Corning Glass Works
Fish-Schurman Corp.
H. & O. Co.
Internat. Glass Corp.
Precision Products

GLASS, Shatterproof for Instruments

Bache & Company, Semon
Behm & Sons
Bristol Co.
Buhl Optical
Cast Optics
Chicago Dial Co.
Dearborn Glass Co.
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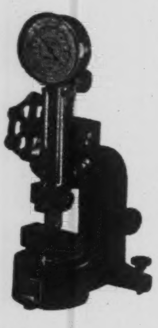

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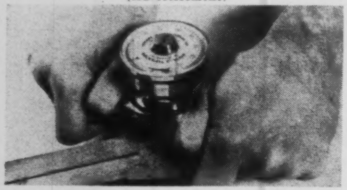

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Penn. Insts. Div.
Phen-Trols, Inc.
Phila. Thermometer Co.
Physical Research Labs.
Powers Reg. Co.
Rochester Mfg. Co.
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Scientific Instr. Co.
Scientific Instr. Devel.
Serdex, Inc.
Soreng Products
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Taylor Instr. Cos.
Tenney Engrg. Co.
Thermo-Electric Co.
Thwing-Albert
Trerice Co., H. O.
United Elect. Controls
U. S. Gauge Div.
Valverde Labs.
Varo Mfg. Co.
Weksler Thermom. Corp.
Weston Electcl. Instr.
White-Rodgers
Zeiss, Inc. Carl

HUMIDITY-SENSITIVE MATERIALS

Bendix-Friez
Carbide & Carbon
Dow Chemical Co.
Seegers Mfg. Co.

HUMIDITY INSTRUMENTS, Conductivimetric

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Bristol Co.
Electric Hotpack Co.
Foxboro Co.
General Mills Inc.
Gow-Mac Instr. Co.
Industrial Instr. Inc.
Leeds & Northrup
Marconi Instruments
Moeller Instr. Co.
Physical Reserach Labs.
Pimex Inc.
Serdex, Inc.
Testing Machines, Inc.

HUMIDITY INSTRUMENTS, Hygrometric

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Barber-Colman
Beckman Div.
Bendix-Friez
Bristol Co.
Burton Mfg. Co.
Cambridge Inst. Co.
Central Scientific
Daystrom Instr. Div.
Draper Mfg. Co.
Driaire, Inc.
Ess Instr. Co.
Ever Ready Thermometer
Fischer & Porter Co.
Foxboro Co.
GE
General Mills Inc.
Glogau & Co.
Gordon Co., Claud S.
Gotham Instr. Div.
Green, Henry J.
Griebel Co.
H-B Instr. Co.
Hiergesell & Sons
Huddleston, J. S. F.
Illinois Testing Labs.
Instruments Corp.
Johnson Service Co.
Kahl Scientific Instr.
Kahn & Co.
Leeds & Northrup
Lennard Co.
Manning, Maxwell & Moore
Mason-Neilan Div.
Mine Safety Appliances
Minneapolis-Honeywell
Moeller Instr. Co.
Palmer Thermometers, Inc.
Phila. Thermometer Co.
Physical Research Labs.
Pimex, Inc.
Powers Reg. Co.

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HI-LO FLOWS—HI-LO PRESSURES

- New Leak Proof Design—Chambers and Cartridges.
- No gas bypassing Cartridge.
- "O" Ring Seal of Chambers and Cartridges.
- Mechanical Filter Elements easily removed for cleaning.
- No tools required to change cartridge or element.
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- For Portable, stationary and airborne installations.

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Sargent & Co.
Scientific Instr. Co.
Seedburo Equipt. Co.
Seegers Mfg. Co.
Serdex, Inc.
Standard Thermometer, Inc.
Taylor Instr. Cos.
Testing Machines, Inc.
Transval Engrg. Corp.
Trerice Co.
Wagner & Son
Wallace & Tiernan
Welch Mfg. Co., W. M.
Weksler Thermom. Corp.
Weston Electcl. Instr.

HUMIDITY INSTRUMENTS, Hydroscopic, including Hair, Plastics, etc.

Amer. Instr. Co.
Anders Lykens Corp.
Barber-Colman
Bendix-Friez
Bristol Co.
Cambridge Intr. Co.
Fielden Instr. Div.
Foxboro Co.
Germanow-Simon Mach. Co.
Gotham Instr. Div.
Green, Henry J.
Hallikainen Instruments
Instruments Corp.
Johnson Service Co.
Kahl Scientific Instr.
Lennard Co., P. M.
Minneapolis-Honeywell
Moeller Instr. Co.
Powers Reg. Co.
Scientific Instr. Co.
Seegers Mfg. Co.
Serdex, Inc.
Taylor Instr. Cos.
Testing Machines, Inc.
Transval Engrg. Corp.
Victory Engrg. Corp.

HUMIDITY INSTRUMENTS, Psychrometric, Indicating

Accuracy Scientific Instr.
Amer. Instr. Co.
Amer. Moistening Co.
Bacharach Indust. Insts.
Beckman & Whitley
Bendix-Friez
Bristol Co.
Brooklyn Thermom. Co.
Central Scientific
Chicago Apparatus Co.
Ever Ready Thermomter
Fischer & Porter Co.
Foxboro Co.
Gotham Instr. Div.
Green, Henry J.
H-B Instr. Co.
Henson Co.
Hiergesell & Sons
Hill & Co.
Instruments Corp.
Johnson Service Co.
Kahl Scientific Inst.
Lennard Co.
Mason-Neilan Div.
Mine Safety Appliances
Minneapolis-Honeywell
Moeller Instr. Co.
Palmer Thermometers, Inc.
Parks-Cramer
Pimex, Inc.
Powers Reg. Co.
Prec. Thermom. & Insts.
Radiation Counter Labs.
Sargent & Co.
Scientific Instr. Co.
Taylor Instr. Cos.
Testing Machines, Inc.
Trerice Co.
U. S. Gauge Div.
Warren-Knight
Weksler Thermom. Corp.
Welch Mfg. Co., W. M.
Williamson Devel. Co.

HUMIDITY INSTRUMENTS, Psychrometric, Recording

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Bristol Co.
Dickson Co.
Fischer & Porter Co.
Instruments Corp.
Johnson Service Co.
Mineapolis-Honeywell
Moeller Instr. Co.
Palmer Thermometers, Inc.
Pimex, Inc.
Powers Reg. Co.
Scientific Instr. Co.
Taylor Instr. Cos.
Trerice Co.
U. S. Guage Div.
Weksler Thermom. Corp.
Welch Mfg. Co., W. M.

HYDROGEN-ION INSTRUMENTS, see pH

HYDROGENATION APPARATUS

Amer Instr. Co.
Autoclave Engrs.
Beckman Div.
Central Scientific
Distillation Products
Greiner Glassblowing Lab.
Kontes Glass
Machlett & Son
Parr Instr. Co.
Podbielniak, Inc.
Precision Scientific
Pressure Prods. Industries
RKL Valve & Mfg.

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Bendix-Friez
Berkeley Div.
Bristol Co.
Central Scientific
Foxboro Co.
Geotechnical Corp.
Gorrell & Gorrell
Green, Henry J.
Gurley, W. & L. E.
Hathaway Instr. Co.
Henson Co.
Instruments Corp.
Instruments, Inc.
Keuffel & Esser
Leupold & Stevens
Martin-Hubbard Corp.
Micro Instr. Co.
North Amer. Instr. Co.
Pacific Scientific
Prec. Thermom. & Insts.
Shasta Div.
Stewart, M. C.
Taylor Instr. Cos.
Uehling Instr. Co.
Virginia Electronics
Warren-Knight
White Co., Inc.

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Accuracy Scient. Instr.
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Bendix Aviation Corp.
Brooklyn Thermom. Co.
Central Scientific
Commercial Res. Div.
Eitzen Co., Louis Co.
Fischer & Porter Co.
Fisher Scientific
Fleischhauer & Son
Foxboro Co.
Freas Glass Works
General Scient. Equipt.
Gotham Instr. Co.
Greiner Co., Emil
Griebel Co., E.
H-B Instr. Co.
Hallikainen Instr. Co.
Hiergesell & Sons
Hill & Co.
Johnson Service Co.
Kahl Scient. Instr.
Kessler Co.
Kimble Glass
Leeds & Northrup
Martin & Co.
Mason-Neilan Div.
Moeller Instr. Co.
Norcross Corp.
Nurnberg Thermom. Co.
Owens-Illinois
Phila. Thermometer Co.
Pimex, Inc.
Prec. Thermom. & Insts.
Rascher & Betzold
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Ruttco Mfg. Co.
Scientific Glass App.
Scientific Instr. Co.
Taylor Instr. Cos.
Testing Machines, Inc.
Testrite Instr. Co.
Trerice Co.
Weksler Thermom. Corp.
Weston Electcl. Instr.

HYDROMETERS, Mud

Accuracy Scient. Instr.
Braun Corp.
Brooklyn Thermom. Co.
Freas Glass Works
Greiner Co., Emil
Griebel Co.
H-B Instr. Co.
Hiergesell & Sons
Kessler Co.
Moeller Instr. Co.
Reliable Instr. Co.
Testing Machines, Inc.
Wagner & Son

HYGROMETERS, see Humidity Instruments, Hygrometric

HYGROSTATS

Amer. Instr. Co.
Barber-Colman
Bendix-Friez
Central Scientific
Johnson Service Co.
Physical Research Labs.
Powers Reg. Co.
Taylor Instr. Cos.

HYGRO THERMOGRAPHS

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Foxboro Co.
Freas Glass Works
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Instruments Corp.
Serdex, Inc.
Taylor Instr. Cos.
Testing Machines, Inc.

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GE
Kahl Scientific Instr.
Keuffel & Esser
Lufkin Rule Co.
Victory Engrg. Co.
Warren-Knight
Welch Mfg. Co., W. M.

ICE WARNING INDICATORS, see Aircraft Instruments

IGNITION LAG INDICATORS, see Engine Test

IGNITION VELOCITY METERS, see Engine Test

IGNITRONS, see Tubes, Ignitron

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Allen-Bradley
Amer. Kloeckner-Moeller
Askania Reg. Co.
Assembly Products
Automatic Elect. Mfg.
Autom. Switch Co.
Autotron Co.
Avion Div.
Betts & Betts
Cutler-Hammer
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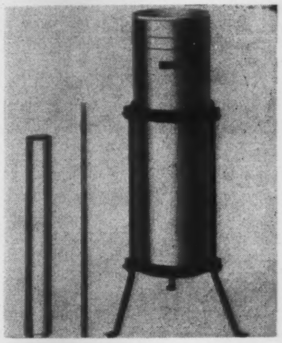
Ebert Electronics
Electronic Control
Electronic Lab.
Electronic Prods.
Electronics Corp. of Amer.
Fisher-Pierce
Flight Res., Inc.
G-M Labs.
General Controls
GE, Apparatus Sales
General Radio
Haledy Electronic Co.
Hermetic Sealing Corp.
Hupp Electronics
Indust. Contr. Panel Co.
Indust. Electronic Contr.
Lumenite Electronic
Magnetic Amplifiers
Magnetic Instr. Co.
Michigan Electronics
Micro Balancing, Inc.
Montgomery Mfg.
Paragon Electric
Phoenix Prec. Instr.
Rockwell Engrg. Co.
Soreng Products
Square D Co.
Superior Electric
Timely Instruments
Tork Clock
United Transf. Corp.
Vocaline Corp.
Ward Leonard
Weston Electcl. Instr.
Worner Electronic Devices
Zenith Electric



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Henry J. Green 5" Rain Gauge
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Henry J. Green
Established 1832

Henry J. Green Instruments, Inc.
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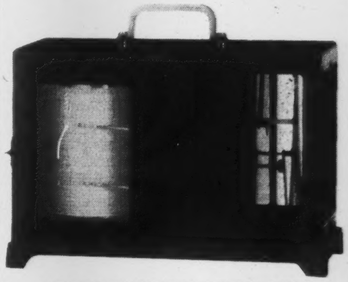

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Two designs: Banjo spread of hairs and 5" clock. Multiple strand hairs and 3½" clock.

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THERMOGRAPHS—Made in accordance with U.S. Weather Bureau. 3½" or 5" clock.

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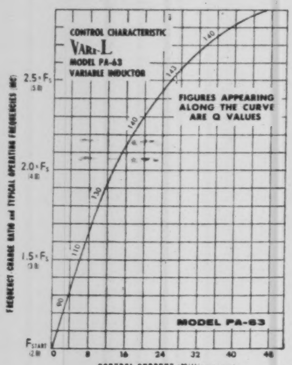
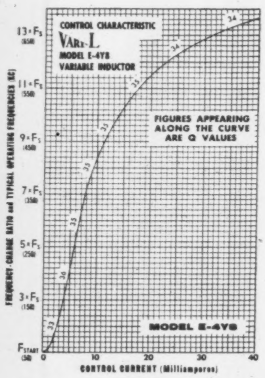
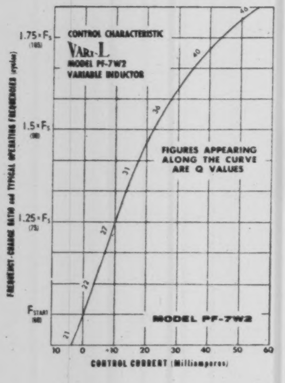


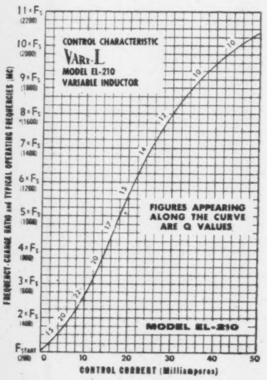
PA-63 Typical Freq. Range, 0-50 ma: 2.0 to 5.8 mc. Starting Inductance, 45 uH ± 10%. Adjustable PM bias, dual control winding. Epoxy-embedded, hi Q, good linearity.


CONTROL CHARACTERISTIC
VARI-L
MODEL E-4Y8
VARIABLE INDUCTOR
FIGURES APPEARING ALONG THE CURVE ARE Q VALUES
MODEL E-4Y8
FREQUENCY-CHANGE RATIO and TYPICAL OPERATING FREQUENCIES (KC)
13×Fs
11×Fs
9×Fs
7×Fs
5×Fs
3×Fs
FSTART
CONTROL CURRENT (Milliamperes)
0
10
20
30
40

Typical Freq. Range, 0-40 ma: 50 to 600 KC. Starting Inductance 40 MH ±15%. Dual control winding, Epoxy-embedded. Slow take-off at low current. **E-4Y8**

PF-7W2 Typical Freq. Range, 0-60 ma: 60 to 110MC. Starting Inductance, 0.5 µH ±10%. Fixed PM bias. Potted in hi-Q, hi-temp. wax. Side terminals for min. lead-length.




CONTROL CHARACTERISTIC
VARI-L
MODEL EL-210
VARIABLE INDUCTOR
FIGURES APPEARING ALONG THE CURVE ARE Q VALUES
MODEL EL-210
FREQUENCY-CHANGE RATIO and TYPICAL OPERATING FREQUENCIES (MC)
11×Fs
10×Fs
9×Fs
8×Fs
7×Fs
6×Fs
5×Fs
4×Fs
3×Fs
2×Fs
FSTART
CONTROL CURRENT (Milliamperes)
0
10
20
30
40
50

Typical Freq. Range, 0-50 ma: 50 to 500 cps. Starting Inductance 50H ±10%. Potted in silicone rubber, very rugged. Good Q at low frequencies in variable-filter applications. **EL-210**

CATALOG A-9/55 ON REQUEST

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Bendix-Friez
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Cambridge Instr. Co.
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Coleman Instruments
DeJur-Amsco
Dearborn Scientific
Eichner Instruments
Electro-Physics Co.
Electro-Tech Equipt. Co.
Ercona Corp.
Esterline-Angus Co.
Farrand Optical
Fecker, Inc.
Fish-Schurman
Fisher Scientific
G-M Labs.
Gaertner Scientific
Gardner Lab.
GE, Apparatus Sales
General Radio
Haines Designed Prods.
Hall Sonic Engrg. Co.
Hellige, Inc.
Hickok Electcl. Instr.
Instrument Devel. Labs.
Instr. Dev. & Mfg. Corp
Internat. Std. Trading
Jarrell-Ash
Kaye Devel. Co.
Klett Mfg. Co.
Lab Optical
Leeds & Northrup
M. B. Mfg. Co.
Macbeth Corp.
Marion Electcl. Instr.
Mass Instruments
Meters, Inc.
Parr Instr. Co.
Pfaltz & Bauer
Phipps & Bird
Phoenix Prec. Instr.
Photo Res. Corp.
Photocon Res. Prods.
Photovolt Corp.
Photron Instr. Co.
Prec. Glass Prods.
Process & Instruments
QOS Corp.
Research Appliance Co.
Rockwell Engrg. Co.
Rubicon Co.
Rudolph & Sons
Sticht Co., Herman H.
Streeter-Amet
Triplett Electcl. Instr.
Weber Aircraft Corp.
Welch Mfg. Co., W. M.
Weston Electcl Instr.
Wollensak Optical
Zeiss, Inc., Carl
Zoomar Corp.

ILLUMINOMETERS, Macbeth
Bendix-Friez
Leeds & Northrup
Macbeth Corp.

IMMERSION LIQUIDS for Inspection of Glass, see Glass Test

IMPACT RECORDERS
Alden Products
Allegany Instr. Co.
Analysis Sales Co.
Baldwin-Lima-Hamilton
Brush Electronics
Epic, Inc.
Gorrell & Gorrell
Hathaway Instr. Co.
Impact Register Co.
Impact-O-Graph
M. B. Mfg. Co.
Testing Machines, Inc
Thwing-Albert

IMPACT TESTING MACHINES, including Pendulum Type
Baldwin-Lima-Hamilton
Chatillon & Sons
Impact Register Co.
Impact-O-Graph Corp.
L.A.B. Corp.
Testing Machines, Inc.
U. S. Testing Co.
Vibr. Measmt. Engrs.

IMPEDANCE MEASURING INSTRUMENTS, including Reactance Meters, Z-Angle Meters, etc.
Acton Labs.
Advance Electronics
Boonton Radio
Clarke Instr. Corp.
Deltron, Inc.
DeMornay-Bonardi
Electro Measurements, Inc.
Electro Products Lab.
Federal Telephone & Radio
Freed Transformer
GE
General Radio Co.
Hewlett-Packard
Indust. Test Equipt. Co.
Jackson Co., Byron
Kay Electric
Marconi Insts.
Narda Corp.
Premier Research Labs.
Ramo-Wooldridge
RCA Div.
Rubicon Co.
Sensitive Res. Instr.
Shasta Div.
Sierra Electronic
Southw. Indust. Electron.
Technology Instruments
Telechrome, Inc.
WacLine, Inc.
Waters Mfg. Co.

IMPREGNATING MACHINES
Red Point Prods.
High Vacuum Equipt. Corp.
Lammert & Mann
Stokes Mach. Co.

INCLINOMETER TUBES
Aeromarine Instr. Co.
Ellison Draft Gage
Fish-Schurman
Flett Laboratory
Helio Instr. Co.
Moeller Instr. Co.
Phoenix Prec. Instr.
Prec. Thermom. & Insts.
Rieker Instr. Co.
Trimount Instr. Co.

INCLINOMETERS, see Aircraft Instruments

INCLINOMETERS, Bore Hole
Edcliff Instruments
Sperry-Sun Well Surveying

INCLINOMETERS, Lateral, Aviation, see Aircraft Instruments

INCLINOMETERS, Ship, see Marine Instruments

INDICATOR LIGHTS, see Pilot Lights

INDICATORS, see Object of Measurement

INDUCTANCE INDICATORS
Aerovox Corp.
Boonton Radio
Electronic Devel. Lab.
Federal Telephone and Radio
Feiler Engrg. Co.
Freed Transf. Co.
GE
General Electronic
General Radio
Industrial Instruments
Industrial Test Equipt.
Leeds & Northrup
Marconi Instruments
Pacific Instr. Co.
Premier Research
Rubicon Co.
Shallcross Mfg. Co.
Sickles Co.
Sierra Electronic Corp.
United Transformer Corp.
Waters Mfg.
Weston Electcl. Instr.

INDUCTANCE STANDARDS, see Standards, Inductance

INDUCTORS, Fixed (see also Coils, also Transformers)
Aerovox Corp.
Airpax Products
Atlantic Transf. Div.
Avion Div.
Boonton Radio
Burnell & Co.
Calif. Magnetic Cont. Corp.
Cambridge Thermionic
Carol Electronics
Carad Corp.
Centronics Co.
Chicago Std. Transf. Corp.
Coast Coil Co.
Colin Campbell Corp.
Communication Access. Co.
Corning Glass Works
Dietz Design & Mfg.
Freed Transf. Co.
General Radio
Gudeman Co.
International Resistance
Johnson Co., E. F.
Kellogg Switchboard
Lenkurt Electric
Magnetic Instr. Co.
NJE Corp.
Pacific Instr. Co.
Southw. Indust. Electron.
Std. Electrical Prods.
Sterling Transf. Corp.
Superex Electronics
Thermador Electcl. Mfg.
Torwico Electronics
Transformers, Inc.
Triad Transf. Corp.
Tri-Dex Electronics
Wheeler Insul. Wire, Inc.

INDUCTORS, Variable, including Decade
Aero Electronics
Aerovox Corp.
Burnell & Co.
Calif. Magnetic Cont. Corp.
Cambridge Thermionic
Centronics Co.
Coast Coil Co.
Corning Glass Works

Dietz Design & Mfg.
Freed Transf. Co.
General Radio
Gudeman Co.
Helipot Div.
Hycor Co., Inc.
Johnson Co., E. F.
Lenkurt Electric
Millen Mfg. Co.
Pacific Instr. Co.
Shasta Div.
Superex Electronics Corp.
Technical App. Builders
Triad Transf. Corp.
Vari-L Co., Inc.

INFRARED DETECTORS (see also Spectrometers)

Anton Electronics Labs.
Autron Engrg., Inc.
Avion Div.
Baird Assocs.-Atomic Instr.
Barnes Engrg. Co.
Consol. Electrodynamics
De-Tec-Tronic Corp.
Electronics Corp. of Amer.
Eppley Lab.
Farnsworth Electronics
Farrand Optical
Hillyer Instr.
Hycon Electronics
Jarrell-Ash
Kaye Devel. Co.
Mine Safety Appliances
Olympic Devel. Co.
Perkin-Elmer
Phoenix Prec. Instr.
Precise Measmts. Co.
QOS Corp.
Servo Corp. of Amer.
Texas Insts., Inc.
Welch Mfg. Co., W. M.

INFRARED SOURCES

Avion Div.
Barnes Engrg. Co.
Edmund Scientific
Farnsworth Electronics
Jarrell-Ash
Kemlite Labs.
Norden-Ketay
Precise Measmts. Co.
Servo Corp. of Amer.
Stupakoff Div.
Ultra Violet Prods.

INKS, Recording

Amer. Rec. Chart Co.
B-I-F Industries
Baird Assocs.-Atomic
Bristol Co.
Brush Electronics
Chart Production Co.
Crown Indust. Prods.
Edin Co.
Esterline-Angus
Fawler-Brost
Foxboro Co.
GE, Apparatus Sales
Gordon Co., Claud S.
Hays Corp.
Lawter Chemicals
Leeds & Northrup
Manning, Maxwell & Moore
Moeller Instr. Co.
Phipps & Bird
Sanford, Inc.
Sound Apparatus Co.
Taylor Instr. Cos.
Technical Charts, Inc.
Thwing-Albert
Trerice Co.
Varian Assocs.
Weksler Thermom. Corp.
Westinghouse Electric

INSPECTION, Glass and Quartz, see Glass Test

INSPECTION DEVICES, Color, see Color

INSPECTION DEVICES, Dimensional (including Concentricity, Cylindricality, Diameter, Thickness, etc.) see Dimensional Gages

INSPECTION DEVICES, Electrical, see Circuit Testers, also Insulation Testers, also Resistance Indicators, etc.

INSPECTION DEVICES, Hardness, see Hardness Testers

INSPECTION DEVICES, Insulated Wire, see Insulation Testers

INSPECTION DEVICES, Optical Projection, see Dimensional Gages

INSPECTION DEVICES, Smoothness, see Dimensional Gages, Surface

INSPECTION DEVICES, Thickness, see Dimensional Gages, also Thickness Gages

INSPECTION EQUIPMENT, Welding, see Flaw Detectors

INSPECTION EQUIPMENT, Bore Hole, see Telescopes, Bore Inspection

INSPECTION EQUIPMENT, Nondetsructive, see Flaw Detectors

INSPECTORS, MAGNETIC, see Flaw Detectors, Magnetic

INSTRUMENT CASES, see Cases

INSTRUMENT CLEANING MACHINES, see Cleaning Machines

INSTRUMENT COVERS, see Covers, also Cases

INSTRUMENT FUSES, see Fuses

INSTRUMENT HOUSINGS, see Panels

INSTRUMENT LUBRICANTS, see Lubricants

INSTRUMENT PACKAGING, see Cases

INSTRUMENT PIVOTS and BEARINGS, see Pivots

INSTRUMENT REPAIRING TOOLS, see Tools

INSTRUMENT TRANSFORMERS, see Transformers

INSTRUMENT TUBING and FITTINGS, see Tubing and Fittings

INSTRUMENT TUBING SUPPORTS, see Tubing Supports

INSULATION, Electrical

Acme Wire
Amer. Lava Corp.
Amer. Phenolic Corp.
Armstrong Cork
Auburn Mfg. Co.
Bakelite Div.
Bentley, Harris Mfg.
Biggs Co.
Brady Co., W. H.
Brand and Co.
Cast Optics
Continental-Diamond Fibre
Dolph, John C.
Du-Co Ceramics
du Pont de Nemours
Durez Plastics & Chem.
Dynakon Corp.
Electronic Mechanics, Inc.
Emerson & Cuming
Federal Screw Prods.
Formica Co.
GE
Hermetic Sealed Prods.
Insulation Mfrs. Corp.
Lapp Insulator
Mica Insulator
Microcircuits Co.
Minnesota Mining & Mfg.
Mycalex Corp. of Amer.
Natl. Varnished Prods.
Polymer Corp.
Precision-Paper Tube
Rex Corp.
Richardson Co.
Rogan Bros.
Sandee Mfg. Co.
Sauereisen Cement
Sequoia Wire
Spaulding Fibre Co.
Steatite Div.
Stupakoff Div.
Superior Steatite
Suprenant Mfg. Co.
Textolite Dept.
U. S. Gasket Co.
U. S. Rubber
Wilmington Fibre
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INSULATION, Hard Rubber

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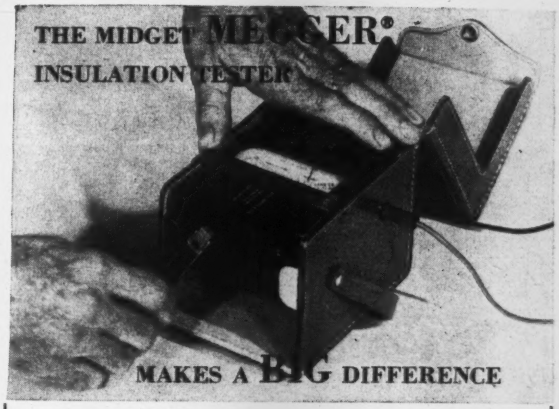

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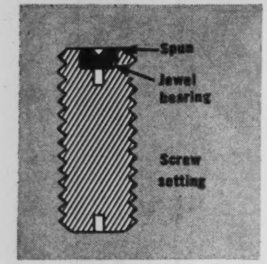
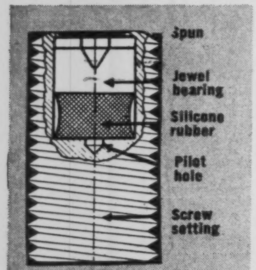

Spun
Jewel bearing
Screw setting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Silicone rubber
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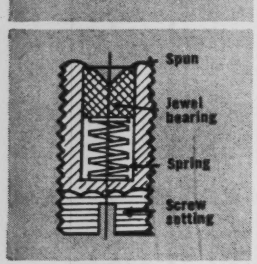
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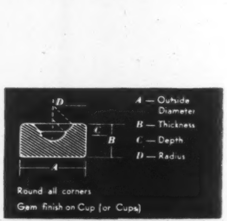
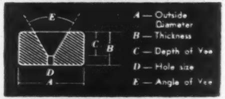
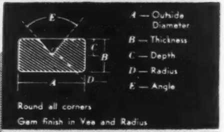
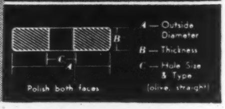

D
C
B
A
A — Outside Diameter
B — Thickness
C — Depth
D — Radius
Round all corners
Gem finish on Cup (or Cups)


E
C
B
D
A
A — Outside Diameter
B — Thickness
C — Depth of Vee
D — Hole size
E — Angle of Vee


E
C
B
A
D
A — Outside Diameter
B — Thickness
C — Depth
D — Radius
E — Angle
Round all corners
Gem finish in Vee and Radius


B
C
A
A — Outside Diameter
B — Thickness
C — Hole Size & Type (olive, straight)
Polish both faces

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INSULATORS, Thermocouple, see Thermocouple Insulators

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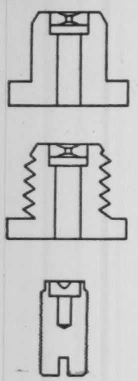

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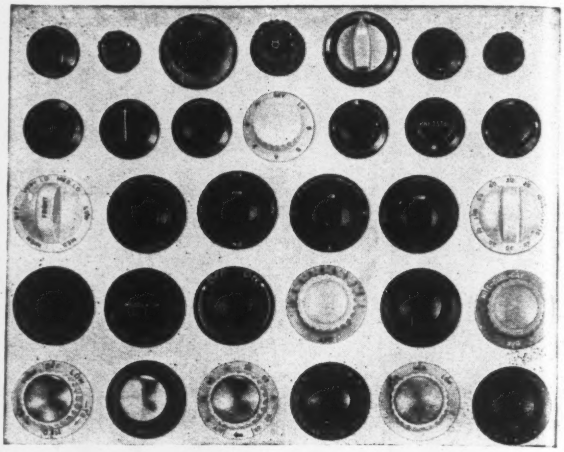

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LAMPS, Monochromatic, see Light Sources, Monochromatic

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LATHES, see Machines, Lathes

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U. S. Testing Co.

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Airflyte Electronics
Amer. Gas & Chemicals
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Fisher Res. Lab.
Gates & Co.
Goldak Co.
Magnaflux Corp.
Menlo Research Lab.
Peerless Electric
Precision Electronics, Inc.

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Aircraft Electronics
Amer. Electronics
Amer. Gas & Chemicals
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Baird Assocs.-Atomic
Beckman Div.
Bendix Aviation Corp.
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Davis Instruments Div.
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Gates & Co.
GE. Apparatus Sales
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Kahn & Co.
Kinetic Engrg. Co.
Linde Air Products
Magnaflux Corp.
Marsh Corp., Jas. P.
Menlo Res. Lab.
Meriam Instr. Co.
Mine Safety Appliances
Moore Products
Municipal Instr. Co.
National Res. Corp.
Nuclear Corp. of Amer.
Peerless Electric
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Scott Testers
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Testing Machines, Inc.
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LENGTH INDICATORS, see Dimensional Gages

LENGTH STANDARDS, see Standards, Length

LENS COATING, see Optical Parts

LENS MOUNTINGS, see Optical Parts

LENS TESTERS, including Lens Thickness, Focal Length, etc.

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Amer. Optical
Ann Arbor Optical
Askania-Werke A. G.
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Bronoptics Co.
Buhl Optical
Burke & James
Chicago Dial Ind. Co.
Curtiss Labs.
Engis Equipt. Co.
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Ercona Corp.
Esco Prods. Co.
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Federal Prods. Corp.
Gaertner Scientific
Gordon Enterprises
Hall-Barkan
Instrument Devel. Labs.
Lab. Optical
Los Angeles Scient. Instr.
Lynn, Robert M.
Mann Co., W. I.
Merry Instr. Co.
Opplem Co., Inc.
Palos Optical
Penn Optical & Instr.
Perkin-Elmer
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QOS Corp.
Robertshaw-Fulton
Testa Mfg. Co.
Testing Machines, Inc.
Unertl Optical
Zoomar Corp.

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Co-Optical Mfg.
Corning Glass Wks.
Dialight Corp.
Drake Mfg.
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Edna Lite Co.
Esco Prods. Co.
Felsenthal Sons
Fish-Schurman
General Scientific
Hayward Glass Co.
Heitz, Inc., Karl
Inlaid Optical
Johnson Co., E. F.
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Kirkland Co., H. R.
Lancaster Lens Co.
Lynn, Robert M.
Parisian Novelty Co.
Plummer Kershaw
Precision Prods. Co.
Regal Instr. Co.
Richardson Co.
Signal Indicator Corp.
Simpson Optical
Torrance Glass & Color
  Works

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Apex Optical
Askania-Werke A. G.
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Bausch & Lomb
Bray Optical
Bronoptics Co.
Burke & James
Cal-Astro Optical
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Commercial Optical Mfg.
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Dome Precision Corp.
Eastman Kodak
Edmund Scientific
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Fosdick Glass Co.
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Heitz, Inc., Karl
Houston Technical Labs.
Inlaid Optical
International Optical
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Johnson Co., E. F.
Jones Optical Works
Keim Precision Mirrors
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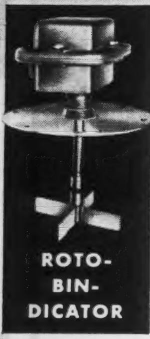

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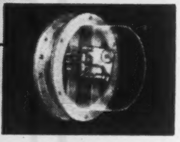

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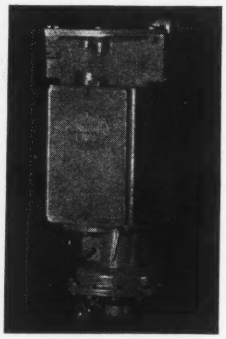

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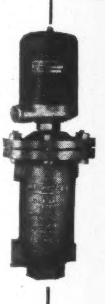

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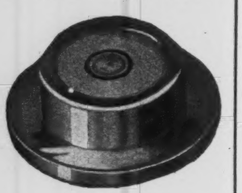

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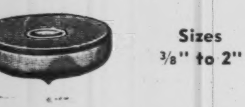

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LEVELS, Wye, see Surveying Instruments

LIE DETECTORS, see Polygraphs

LIGHT METERS, see Illumination

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Edmund Scientific
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Western Union
Worner Electronic Devices

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Continental Electric
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Gates & Co., George W.
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Haledy Electronic Co.
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Worner Electronic Devices
Zeiss, Inc., Carl

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Stocker & Yale
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Van Keuren Co.
Williamson Devel. Co.
Westinghouse Electric
Zeiss, Inc. Carl

LIGHT SOURCES, Ultraviolet, see Ultraviolet

LIGHT WAVE MEASURING EQUIPMENT, see Spectrum Analyzers

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Triumph Mfg. Co.
Wallace & Tiernan

LIGHTHOUSE TUBES, UHF, see Tubes

LIGHTING CONTROLLERS, see Illumination Controllers

LIGHTING SYSTEMS, Instrument, see Pilot Lights

LIGHTS, see Pilot Lights

LIGHTS, Pilot, see Pilot Lights

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Rubicon Co.
Sensative Res. Instr.
Sherron Metallic
Simpson Electric
Sticht Co., Herman H.
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United Mfg. Co. Div.
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LIQUID LEVEL, Indicators or Recorders, see Level, Liquid

LIQUID METERS, Inferential Type, see Flowmeters, Inferential Type

LIQUID METERS, Positive Types, see Flowmeters, Positive Displacement

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Indikon Co.
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Kistler Instr. Co.
Link Engrg. Co.
Phoenix Prec. Instr.
Ruge Assocs.
Statham Labs.
Thwing-Albert
Westronics, Inc.
Wiancko Engrg. Co.

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Control Engrg. Co.
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Streeter-Amet
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LOCATORS, Fault, Electrical Resistance, see Fault Locator

LOCATORS, Pipe, see Metal Detectors

LOGGERS, Automatic Data, see Data Processing

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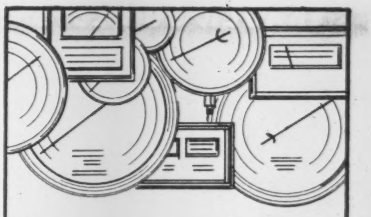

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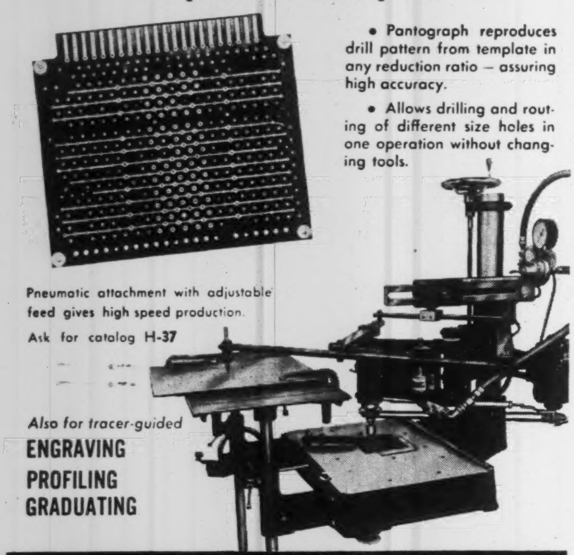

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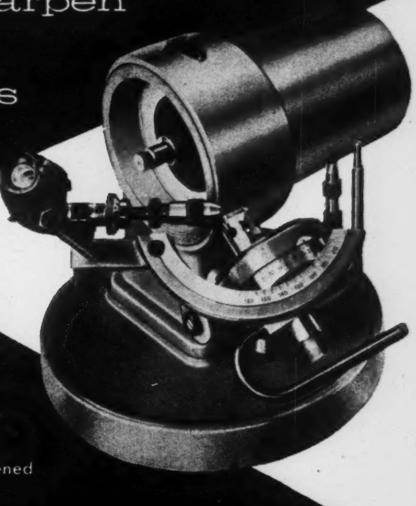

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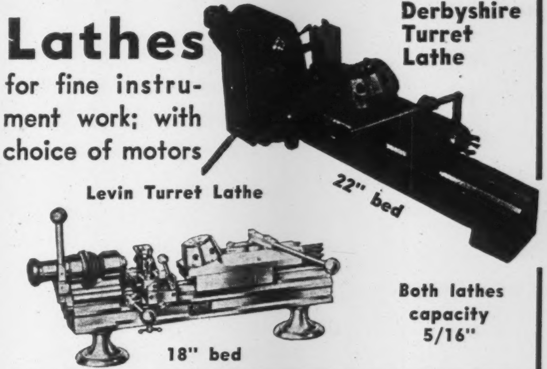

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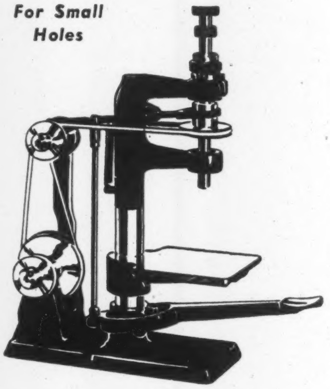

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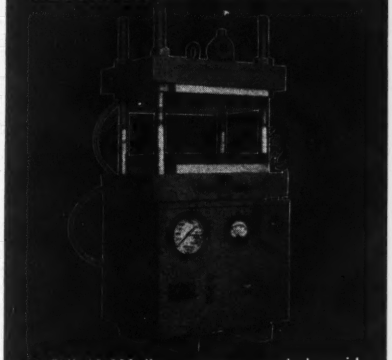

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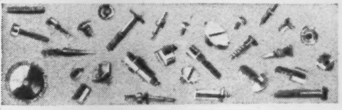

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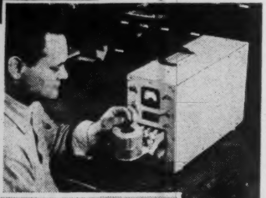

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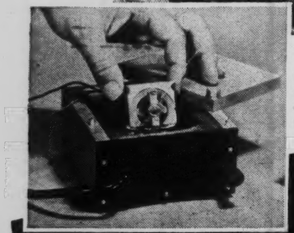

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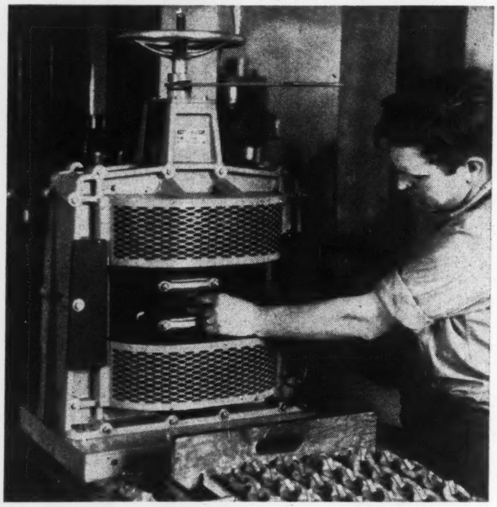

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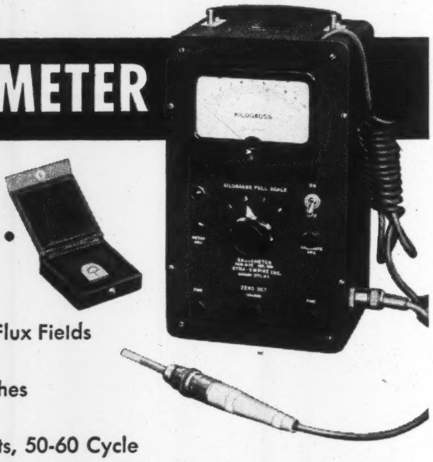

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MAGNETIC TAPE RECORDERS, see Recorders, Magnetic Tape

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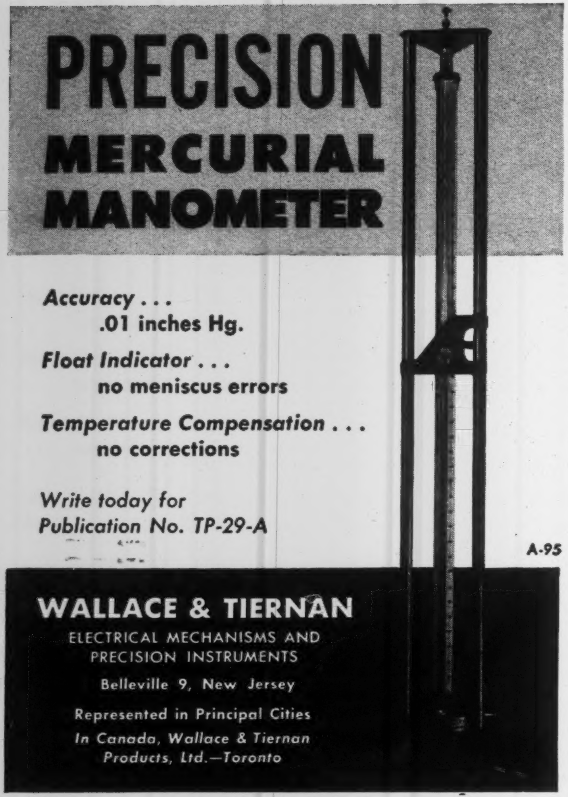

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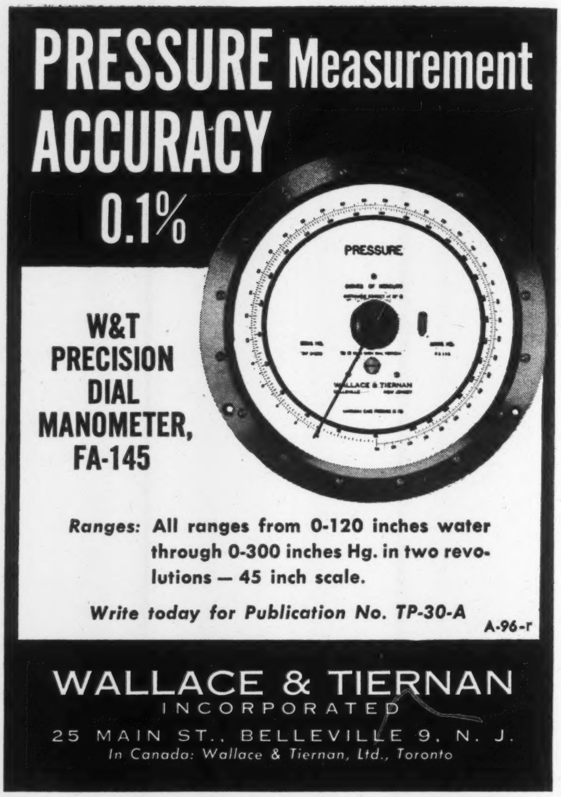

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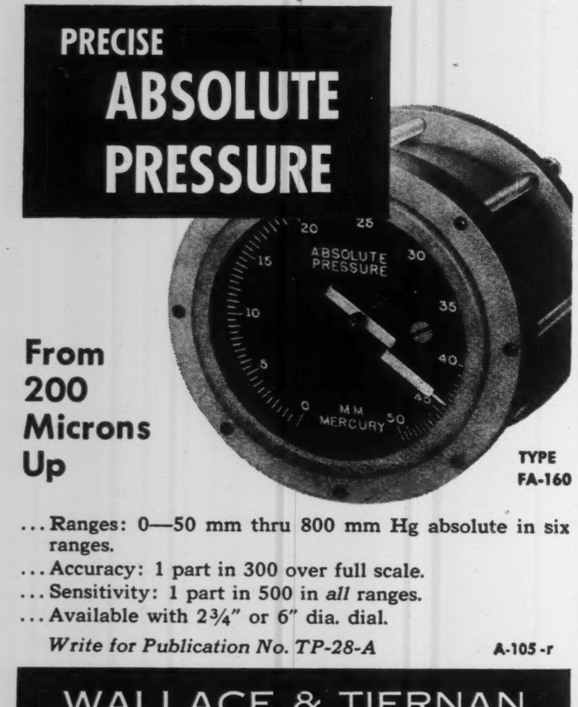

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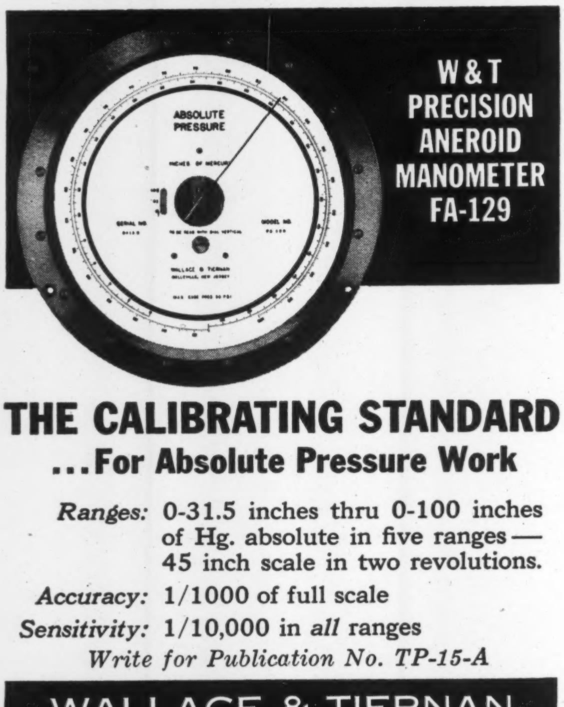

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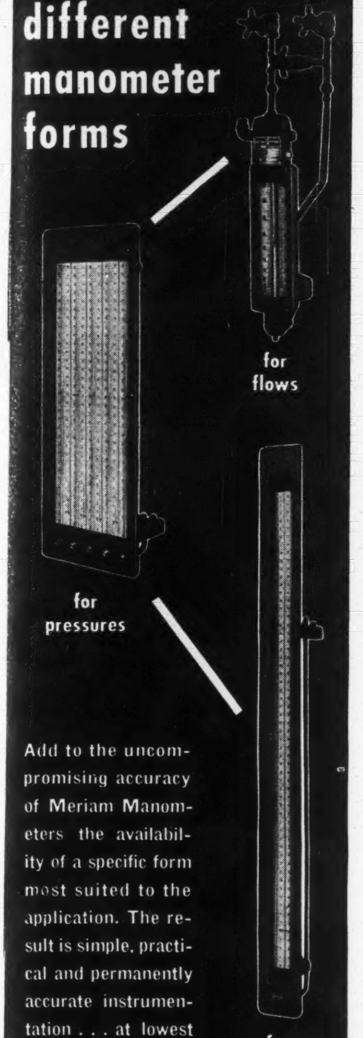

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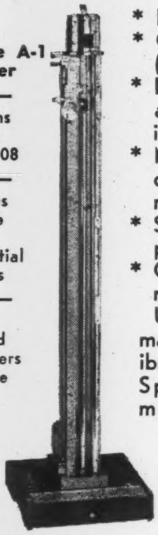

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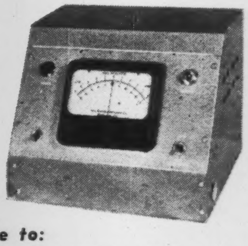

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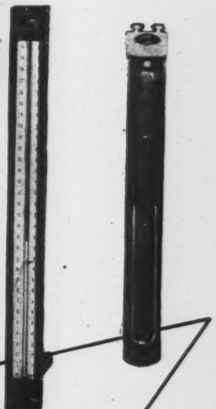

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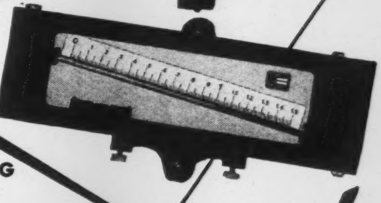

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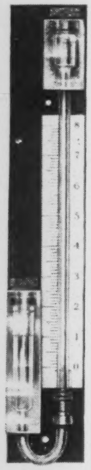

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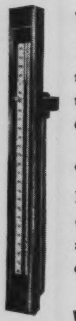

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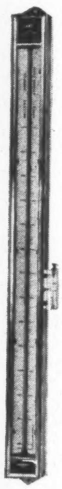

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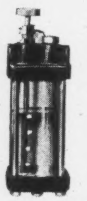

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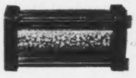

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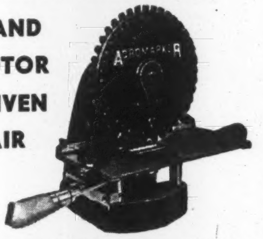

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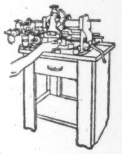

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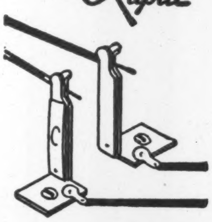

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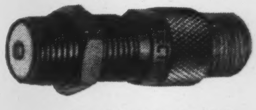

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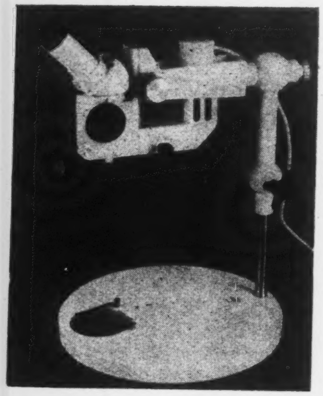

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Ithaca, New York

For more information circle **226** on inquiry card.

Bushnell Optical
Cal-Astro Optical Labs.
Commercial Optical
Curtiss Labs. Inc.
Eastman Kodak
Edmund Scientific
Engis Equipt. Co.
Enteco Industries
Esco Prods. Co.
Evap. Metal Films
Farrand Optical
Fecker, Inc.
Fish-Schurman
Fosdick Glass
Gaertner Scientific
Genl. Scient. Corp.
Gordon Enterprises
Helio Instr. Co.
Henson, Fred C.
Houston Technical Labs.
International Optical
Jaegers, A.
Jones Optical Works
Keim Prec. Mirrors
Lab. Optical
Leroy Clausing Co.
Mann Co., Wm. I.
Micromat Co.
Optical Coating Lab.
Optical Film Engrg.
Optron Lab.
Pacific Optical
Pacific Transducer
Pacific Univ. Prods.
Palos Optical
Pan-Technics, Ltd.
Pancro Mirrors, Inc.
Perkin-Elmer
Phoenix Prec. Instr.
Plummer & Kershaw
Precision Products
Ransom Labs.
Regal Instr. Co.
Renick Co., L. C.
Schneider-Cogswell
Schutte Optical
Simpson Optical
Starr Corp.
Testa Mfg. Co.
Texas Insts., Inc.
Tinsley Labs.
Unertl Optical
United Optical
Zenith Optical Lab.
Zenith Optical Co.
Zoomar Corp.

MIRRORS, Instrument

Acme Scientific
Amer. Optical
Askania-Werke A. G.
Bache & Company, Semon
Baird Assocs.-Atomic
Bausch & Lomb
Behm & Sons
Boehmke Optical
Bray Optical
Bronoptics Co.
Buhl Optical
Cal-Astro Optical Labs.
Cohn Corp., Sigmund
Commercial Optical
Corning Glass Wks.
Dearborn Glass Co.
Dearborn Scientific
Edin Co.
Edmund Scientific
Edna Lite Co.
Esco Prods. Co.
Evap. Metal Films
Farrand Optical
Fecker, Inc.
Fish-Schurman
Fosdick Glass
Gaertner Scientific
GE
Goerz Amer. Optical
Gurley, W. & L. E.
Hanovia Chem. Mfg.
Hathaway Instr. Co.
Henson, Fred C.
Herron Optical
Houston Technical Labs.
Jaegers, A.
Jones Optical Works
Keim Prec. Mirrors
Koehler Instr. Co.
Kollmorgen Optical
Lab. Optical
Leroy Clausing Co.
Mann Co., Wm. I.
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National Research Corp.
Optical Coating Lab.
Optical Film Engrg.
Optron Lab.
Pacific Optical
Pacific Univ. Prods.
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Perkin-Elmer
Practo Photo
Precision Products
Ransom Labs., John H.
Regal Instr. Co.
Schneider-Cogswell
Simpson Optical
Starr Corp.
Testa Mfg. Co.
Texas Insts., Inc.
Tinsley Labs.
Unertl Optical
Univis Lens Co.
Wilder, Inc.
Zenith Optical Co.
Zenith Optical Lab.

MIRRORS, Semi-Transparent

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Baird Assocs.-Atomic
Bausch & Lomb
Behm & Sons
Boehmke Optical
Bray Optical
Bronoptics Co.
Buhl Optical
Cal-Astro Optical Labs.
Commercial Optical
Curtiss Labs. Inc.
Eastman Kodak
Edmund Scientific
Edna Lite Co.
Evap. Metal Films
Farrand Optical
Fecker Inc.
Fish-Schurman
Fosdick Glass
Gaertner Scientific
Genl. Scient. Corp.
Houston Technical Labs.
International Optical
Jaegers, A.
Jones Optical Works
Keim Prec. Mirrors
Kollmorgen Optical
Lab. Optical
Leroy Clausing Co.
Mann Co., Wm. I.
Micromat Inc.
Miller Instruments
Optical Coating Lab.
Optical Film Engrg. Co.
Optron Lab.
Pacific Optical
Pacific Univ. Prods.
Palos Optical
Pan-Technics, Ltd.
Pancro Mirrors, Inc.
Perkin-Elmer
Practo Photo Acces.
Prec. Prods. Co.
Regal Instr. Co.
Schneider-Cogswell
Simpson Optical
Starr Corp.
Testa Mfg. Co.
Tinsley Labs.
Unertl Optical
Zenith Optical Co.
Zenith Optical Lab.

MODULATION INDICATORS

Air-O-Tronics
Amer. Electroneering
ARF Products
Cole Instr. Labs.
Computer Co. of Amer.
Donner Scientific
Electronic Devel. Lab.
Farnsworth Electronics
Federal Telephone & Radio
GE
General Radio Co.
Kay Electric Co.
Knights Co.
Lampkin Labs., Inc.
Marconi Instruments
Marion Electcl. Meter
New London Instr.
Panoramic Radio Co.
RCA Div.
Sylvania Elect. Prods.
Virginia Electronics
Weston Electcl. Instr.

MODULATORS, Magnetic

Airpax Prods. Co.
Avion Div.
Brit. Electronic Sales
Helipot Div.
Hycor Div.
Magnetic Research Corp.
Potter Instr. Co.
Servo Corp. of America
Std. Electronic Res.
Sylvania Elect. Prods.
Timely Insts. & Conts.
Trerice Electronics, Inc.

MOISTURE CONTROLLERS, see Humidity

MOISTURE INDICATORS (see also Humidity also Environmental Test)

Brabender Corp.
Cambridge Instr. Co.
Delmhorst Instr. Co.
Dittert Co.
Electronic Prods. Co.
Ferner Co.
GE
H & H Thermostats
Hart Moisture Gage
King Engrg. Co.
Marconi Instruments
Measurements Corp.
Moisture Register Co.
Precision Scientific
Seedburo Equipt. Co.
Serdex, Inc.
Sherron Metallic
Tri-Dex Electronics
Weston Electcl. Instr.

MOLECULAR STILLS, see Distillation Apparatus

MOLDERS OF PLASTICS

Aerolite Electronics
Allegheny Plastics
Alden Products
Amer. Hard Rubber Co.
Amer. Phenolic Corp.
Armstrong Cork
Auburn Button Wks.
Barber-Colman
Bel-Art Products
Blossom Mfg. Co.
Boonton Molding Co.
Breeze Corp.
Canfield Rubber Co.
Carbide & Carbon
Carroll Co., J. B.
Chicago Molded Prods.
Consol. Mld. Prods.
Continental-Diamond Fibre
Crane Packing Co.
Dimco-Gray
Dynakon Corp.
Eby, Inc., Hugh H.
Edroy Products
Electro Devel. Co.
Electronic Mechanics
Erie Resistor
Felsenthal & Sons
Formica Co.
Garde Mfg.
Garlock Packing
GE
General Industries Co.
Gits Molding Corp.
Grammes & Sons
Grayhill
Gries Reproducer
Grigoleit Co.
Imperial Molded Prods.
Inlaid Optical
Instrument Corp.
Instrument Tool & Engrg.
Joy Mfg. Co.
Keller Products
Kellogg Switchboard
Kulka Elect. Mfg. Co.
Lab-Tronics
Luzerne Rubber
Mass. Gear & Tool
Millen Mfg. Co.
Molded Insulation Co.
Remler Co.
Richardson Co.
Rogan Bros.
Sillcocks-Miller
Slip Ring Co. of Amer.
Stokes Molded Prods.
Surprenant Mfg. Co.
Sylvania Elect. Prods.
Taylor Mfg. Co.
Telex, Inc.
Tube Turns Plastics
Tungsten Contact Mfg.
U. S. Gasket Co.
Waterbury Cos.
Werner Co.
White Dental Mfg.

MOLDS for PLASTIC and RUBBER

Acme Scientific
A & M Tool & Die Co.
Amer. Hard Rubber Co.
Chicago Molded Prods.
Electro Devel. Co.
Gorton Machine Co.
Grigoleit Co.
Instrument Tool & Engrg.
Jessop Steel
Joy Mfg.
Molded Insulation Co.
Remler Co.
Res. Appliance Co.
Richardson Co.
Rogan Bros.
Schmidt, Inc., Geo. T.
Slip Ring Co. of Amer.
Sylvania Elect. Prods.
Taylor Mfg. Co.
Tungsten Contact Mfg.
Waterbury Cos.
Western Supplies Co.

MOLYBDENUM

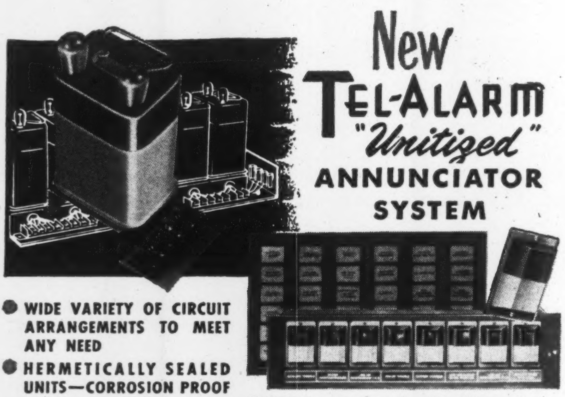
Amer. Electro Metal
Amer. Silver Co.
Anti-Corrosive Mtl. Prods.
Baker Chem. Co.
Belmont Smg. & Refg.
Cleveland Tungsten
Cohn Corp., Sigmund
DoAll Co.
Fansteel Metallurgical
GE, Lamp Wire & Phos. Dept.
Kemet Labs.
Mallory & Co., P. R.
North Amer. Philips
Secon Metals Corp.
Stupakoff Div.
Sylvania Elect. Prods.
Universal-Cyclops
Westinghouse Electric
Wilson Co., H. A.

MONEL METAL PARTS

Albany Prods. Co.
Anti-Corrosive Mtl. Prods.
Autoscrew Co.
Driver-Harris
Falstrom Co.
Gervos Instruments
Grammes & Sons
Hartford Mach. Screw
Instrument Parts Corp.
Koehler Instr. Co.
Lewyt Corp.
Newark Wire Cloth
Rochester Mach. Screw
Schnitzer Alloy Prods.
Sylvania Elect. Prods.
Tinnerman Products
U. S. Indesble. Gasket
Webber Metal Works
Western Auto. Mach. Sc.

MONITORS, including Annunciators

Airborne Instruments
Auth Elect. Spec.
Authorized Mfrs. Service
Autocall Co.
Autom. Control Co.
Automatic Electric
Automatic Elect. Mfg.
Autom. Temp. Contr. Co.
Bailey Meter Co.
Beck & Co.
Bendix, Pacific
Beta Corp.
Betts & Betts
Biddle Co., James G.
Bogue Elect. Mfg.
Bristol Co.
Browning Lab.



New TEL-ALARM "*Unitized*" ANNUNCIATOR SYSTEM

- **WIDE VARIETY OF CIRCUIT ARRANGEMENTS TO MEET ANY NEED**
- **HERMETICALLY SEALED UNITS—CORROSION PROOF**
- **BACKLIGHTED NAMEPLATES OR TURRET LENSES**
- **STANDARDIZED FOR EASY USE—LOWER COST**

HERE is the first "unitized" annunciator. Tel-Alarm incorporates a basic relay unit with many different circuit arrangements available because of a unique switchboard circuit-header. Tel-Alarm is completely standardized for low cost and easy maintenance.

Tel-Alarm is corrosion proof, hermetically sealed and meets any Class I, Division 2 application. The units are completely self-contained — no complicated wiring—and merely plug into a standard Tel-Alarm chassis. Simple and easy to install.

You can get backlighted nameplates or the new Tel-Alarm *giant* turret lenses for greater visibility. Check into Tel-Alarm today.

Send for your free copy of Bulletin 440

Contains complete circuit sequence diagrams, full range of models for every need.

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4332 North Western Ave., Chicago, Ill.
"Protecting America's Industry"

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Cannon Electric
Century Electronics
Cincinnati Time Rec.
Colortone Electronics
Con Ray Corp.
Cook Electric
Cooper Co., Clark
De-Tec-Tronic Corp.
Eastern Industries
Edison, Inc., Thomas A.
Edwards, L. V.
Elect. Indicator Corp.
Electro Devices, Inc.
Fisher & Porter Co.
Foxboro Co.
GE, Apparatus Sales
Guardian Elect. Mfg. Co.
Haydon Co., A. W.
Henschel Corp.
Holtzer-Cabot
Hupp Instrumation
Industrial Timer Corp.
Instruments Inc.
Internat. Bus. Mach.
Internat. Std. Trading
Jaidinger Mfg.
Kirkland Co.
Koehler Instr. Co.
Kybernetes Corp.
Leeds & Northrup
Leslie Co.
Leupold & Stevens
Lumenite Electronic
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Martin-Hubbard
Mason-Neilan Div.
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Montgomery Mfg. Co.
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NRD Instr. Co.
Nuclear Research
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Phoenix Prec. Instr.
Photoswitch Div.
Production Instr. Co.
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Rochester Mfg. Co.
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Servo Corp. of Amer.
Signal Engrg. & Mfg.
Science Engrg. Co.
Standard Elect. Time
Syncro-Start Prods.
Taller & Cooper
Tele-Dynamics
Thompson Clock
Tigerman Engrg. Co.
Union Switch & Signal
Viking Instruments
Wallace & Tiernan
Warren Telechron

MONITORS, Radioactivity, see Radiation Alarms, also Radioactivity

MONOCHROMATIC LIGHT SOURCES, see Light Sources, Monochromatic

MONOCHROMATORS, including Infrared

Applied Physics Corp.
Applied Research Labs.
Baird Associates-Atomic
Bausch & Lomb
Beckman Div.
Biddle Co., James G.
Cambridge Thermionic
Ercona Corp.
Farrand Optical
Fecker, Inc.
Ferner Co.
Gaertner Scientific
GE, Instrument Dept.
GE, X-Ray Dept.
Green Rectifier Co.
Instrument Devel. Labs.
International Devel. Co.
Jarrell-Ash
Kauffman-Lattimer
Lab. Optical
Leeds & Northrup
Leitz, Inc.
Los Angeles Scientific
Opplem. Co.
Perkin-Elmer
Photovolt Corp.
Process & Instruments
Rudolph & Sons
Servo Corp. of Amer.
Zeiss, Inc., Carl

MOTION INDICATORS and/or RECORDERS, see Displacement, also Speed, also Accelerometers

MOTOR STARTERS, see Starters, Motor

MOTORS, Clock, see Clockworks

MOTORS, Fractional Horsepower, including Reversible and/or Synchronous

Air Associates
Airborne Access. Corp.
AiResearch Mfg.
Air-Marine Motors
Allard Instr. Corp.
Alliance Mfg. Co.
Amer. Electric Motor
Amer. Electronics
Amglo Corp.
Ashland Elect. Prods. Co.
Barber-Colman
Bekey Electric
Bendix, Eclipse-Pioneer
Bendix, Red Bank Div.
Bodine Electric
Borg Equipt. Div.
Bristol Motor Div.
Brown-Brockmeyer
Burke Electric
Burton Mfg.
Cardwell Mfg.
Carter Motor Co.
Century Electric
Chatillon & Sons
Clifton Prec. Prods.
Cramer Controls Corp.
Cyclohm Motor Corp.
Dalmotor Co.
DeJur-Amsco
Delco Appliance Div.
Diehl Mfg. Co.
Doelcam Div.
Doerr Elect. Corp.
Eastern Air Devices
Eicor, Inc.
Electric Indicator Co.
Electric Spec. Co.
Electro Engrg. Prods.
Electro Mechano Co.
El Ray Motor Co.
Elsbert Mfg.
Esterline-Angus
Fairbanks, Morse & Co.
Fairchild Camera
Fairchild Industries Div.
Fasco Industries, Inc.
Fidelity Electric
Ford Instr. Co.
G-M Labs.
Gallien, R. P.
GE, Apparatus Sales
GE, Telechron Dept.
Genl. Industries
General Motors, Delco Div.
Giannini & Co.
Gleason-Avery
Globe Industries
Hagen Mfg. Co.
Hansen Mfg. Co.
Hathaway Instr. Co.
Haydon Co., A. W.
Heller Co.
Holtzer-Cabot
Howard Industries
Howell Elect. Motors
Hubbell Metals, Inc.
Induction Motors Corp.
Instrument Motors Co.
International Register
Internat. Std. Trading
Jack Scient. Instr. Co., Bill
Jadow Inc.
Janette Mfg.
Kearfott Co.
Kendrick & Davis
Kollsman Instr. Corp.
L & R Mfg. Co.
Lafayette Instr. Co.
Lamb Electric
Landis & Gyr

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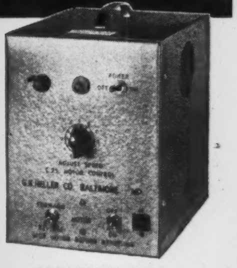
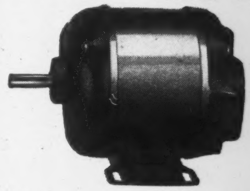
Self-adjusting DC motor speeds from AC lines!

HELLER ELECTRONIC
Control Of Power
MATCHED COMBINATIONS

C-25 ELECTRONIC TUBE OPERATED CONTROLLER
with matching
¼ H.P. DC MOTOR

Complete, F.O.B. Baltimore, Md. $187





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SPECIFICATIONS
- ● Input: 110-120 V., 60 cy. single phase
- ● Output: 0-120 V., 2.5 amps DC to armature
- ● Field constant voltage 110 V. DC
- ● Full ¼ h.p., ball bearing, Master shunt wound DC motor. 200-2000 R.P.M.
- ● Dynamic Brake ● Reversible ● Full torque

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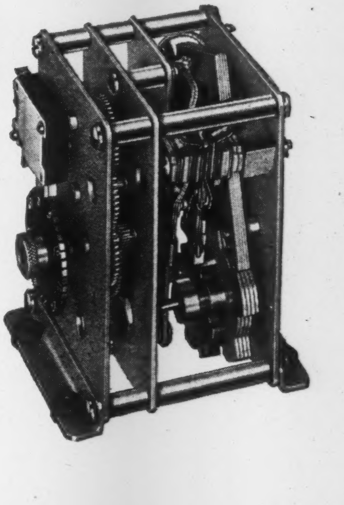
AMGLO
Reed-Controlled DC Motors and Timers



High Torque (200 in. oz. at 1 RPM) —operates from 1 to 30 cams and switches to provide circuit closure at specified sequences and duration.

Low Current Drain—long operation from small batteries or other DC supply.

Magnetic Reed-Control—maintains phenomenal speed accuracy over wide voltage and load variations.

Amglo DC Motors can be furnished—

(1) with built-in reduction gear and output shaft of required speed for mounting cams and switches, and driving other mechanisms, or

(2) the complete timer in one compact unit with cams and switches installed to provide exact sequence specified.

Special Precision AC Timers—built to specifications.

Be sure you have complete data, including performance curves of Amglo Reed-Controlled DC Motors and Timers, on hand—send for your copy.

Quotations and Recommendations without obligation

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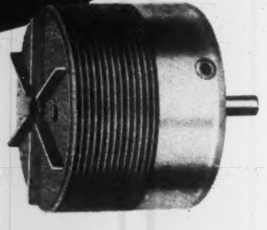
4333 NORTH RAVENSWOOD AVENUE
CHICAGO 13, ILLINOIS

For more information circle 229 on inquiry card.

PRECISION . .

HYSTERESIS MOTORS

SYNCHRONOUS and TORQUE



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of 3"
(Model 300 series)
and 5½"
(Model 500 series)

"Inside out" rotation principle eliminates the use of a flywheel...resulting in exceptional performance

Special consideration given to motors for non-standard applications.

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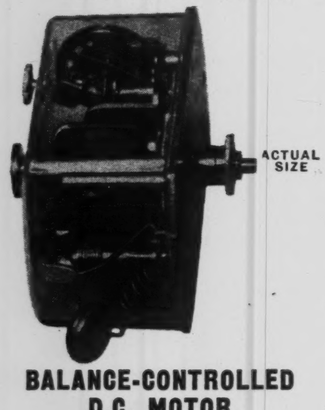
THE NEW ELIX



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D.C. MOTOR

- OPERATES ON A FLASHLIGHT BATTERY FOR MANY MONTHS.
- UNSURPASSED FOR UNATTENDED RECORDING DEVICES.
- USED BY GOVT. AGENCIES.
- OUTPUT SPEEDS: 1 REV. PER 1 HOUR, 12 HOURS OR 24 HOURS
- SPECIAL DESIGNS FOR SMALL-RUN PRODUCTION CONSIDERED.

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Marble-Card
Marco Industries
Master Electric
Merkle-Korff
Minneapolis-Honeywell
Mission-Western
Modern Tech. Supp.
Motordyne Inc.
Natl. Pneumatic Co.
National Time & Signal
New Haven Clock
Newall Mfg. Co.
Norcross Corp.
Ohio Elect. Mfg.
Oster Mfg. Co.
Peerless Electric
Pesco Products
Precise Prods. Co.
Precision Mfg. Co.
Raytheon Mfg. Co.
Rea Company, J. B.
Redmond Co.
Reeves Instr. Co.
Reynolds Electric
Rotating Components
Robbins & Meyers
Sangamo Electric
Scovill Mfg.
Scruggs Co.
Servomechanisms, Inc.
Servo-Tek Products
Signal Elect. Mfg.
Small Motors, Inc.
Specialty Battery Co.
Speedway Mfg. Co.
Sperry Gyroscope
Std. Dayton Corp.
Summers Gyroscope
Technical Devel. Corp.
Thermador Electcl. Mfg.
Seth Thomas Clocks
Times Facsimile Corp.
Transicoil Corp.
U. S. Electcl. Motors
WacLine, Inc.
Wagner Elect. Corp.
Western Gear Corp.
Westinghouse Electric

MOTORS, Geared

Acro Mfg. Co.
Air Associates
Airborne Access. Corp.
Air-Marine Motors Inc.
Amer. Electronics
Amglo Corp.
Ashland Elect. Prods.
Barber-Colman
Bekey Electric
Bendix, Eclipse-Pioneer
Bodine Electric
Borg Equipt. Div.
Brown-Brockmeyer
Cramer Controls Corp.
Cyclohm Div.
Dalmotor Co.
Doelcam Div.
Eastern Air Devices
Electomic Mechanisms
Electro Engrg. Products
El Ray Motor Co.
Fairbanks Morse & Co.
Feedback Controls
Ford Instr. Co.
GE, Apparatus Sales
Genl. Industries
Gleason-Avery
Globe Industries, Inc.
G. M. Labs., Inc.
Hansen Mfg. Co.
Haydon Co., A. W.
Haydon Mfg. Co.
Heller Co., G. K.
Holtzer-Cabot
Howard Industries
Induction Motors Corp.
Kearfott Co.
Kollsman Instr. Co.
Lamb Electric
Lear, Inc.
Lectronic Research Labs.
Master Electric
Merkle-Korff
Minneapolis-Honeywell
Motordyne Inc.
Natl. Pneumatic Co.
Oster Mfg. Co., John
Peerless Electric
Pesco Products
Phila. Gear Works, Inc.
Rea Company, J. B.
Reliance Elect. & Engrg.
Res. Appliance Co.
Robertshaw-Fulton
Robbins & Myers
Rotating Components
Sangamo Electric
Scruggs Co.
Servomechanisms, Inc.
Servo-Tek Products
Small Motors Inc.
Speedway Mfg.
Std. Dayton Corp.
Sterling Prec. Instr.
Summers Gryoscope
Systems Analyzer Corp.
Transcoil Corp.
U. S. Electcl. Motors
WacLine, Inc.
Western Gear Corp.
Westinghouse Electric

MOTORS, Laboratory

Ace Glass
Amglo Corp.
Arma Corp.
Ashland Elect. Prods.
Barber-Colman
Bekey Electric
Bodine Electric
Borg Equipt. Div.
Bogue Elect. Mfg.
Central Scientific
Cramer Controls Corp.
Crow Electri-Craft
Cyclohm Div.
Dalmotor Co.
Doelcam Div.
Eastern Air Devices
Elect. Indicator Co.
Electro Engrg. Prods.
Fasco Industries
Ford Instr. Co.
GE, Apparatus Sales
GE, Telechron Dept.
Genisco, Inc.
Gleason-Avery
Haydon Mfg. Co.
Heller Co., G. K.
Holtzer-Cabot
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Kollsman Instr. Div.
L.A.B. Corp.
L. & R. Mfg. Co.
Lectronic Res. Labs.
Marco Industries
Master Electric
Merkle-Korff
Minneapolis-Honeywell
National Pneumatic Co.
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Palo-Myers
Parr Instr. Co.
Peerless Electric
Rea Co., Inc., J. B.
Res. Appliance Co.
Robbins & Myers
Rotating Components, Inc.
Scruggs Co.
Servomechanisms, Inc.
Small Motors, Inc.
Summers Gyroscope
Thermador Electcl. Mfg.
Times Facsimile Corp.
WacLine Mfg. Co., W. M.
Western Gear Corp.
Westinghouse Electric

MOTORS, Servo, see Servomotors

MOTORS, Step type, see Switches, Stepping

MOTORS, Synchronous

Air Associates
AiResearch Mfg.
Air-Marine Motors
Alina Corp.
Amer. Electronics Inc.
Amglo Corp.
Ashland Elect. Prods.
Barber-Colman
Beck Co.
Bendix, Eclipse-Pioneer
Bekey Electric
Bodine Electric
Bogue Elect. Mfg.
Borg Equipt. Div.
Bristol Motor Div.
Burke Electric
Clifton Prec. Prods.
Coleman Instruments
Columbia Elect. Mfg.
Cramer Controls Corp.
Cyclohm Div.
Dalmotor Co.
Doelcam Div.
Eastern Air Devices
Electric Indicator Co.
Electyme Motor Prods.
Fairbanks, Morse & Co.
Fairchild Camera
Ford Instr. Co.
GM Labs.
General Control Co.
GE, Apparatus Sales
GE, Sm. Motors Dept.
GE, Telechron Dept.
General Motors, Delco Div.
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Master Electric Co.
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Motordyne Inc.
National Pneumatic Co.
Oster Mfg.
Paragon Electric
Peerless Electric
Precision Mfg. Co.
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Robbins & Myers
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Small Motors, Inc.
Speedway Mfg. Co.
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Western Gear Corp.
Westinghouse Electrio

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Eastern Air Devices
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Electric Spec. Co.
Fasco Industries
Ford Instr. Co.
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General Motors, Delco Div.
Giannini, G. M.
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Holtzer-Cabot
Howard Industries
Induction Motors Corp.
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Lamb Electric
Lear, Inc.
Luther Mfg. Co.
Master Electric
Merkle Korff
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National Pneumatic Co.
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Servomechanisms, Inc.
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Technical Electronics Corp.
U. S. Electcl. Motors, Inc.
WacLine, Inc.
Western Gear Corp.
Westinghouse Electric

MOTORS, Unidirectional, Small, AC

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Amer. Electronics
Ashland Elect. Prods. Co.
Barber-Colman
Bekey Electric
Bendix Aviation Corp.
Bodine Electric
Cedar Engrg., Inc.
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Dalmotor Corp.
Diehl Mfg. Co.
Doerr Electric
Eastern Air Devices
Elect. Indicator Co.
Electric Spec. Co.
Fasco Industries
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Ford Instr. Co.
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GE, Sm. Motors Dept.
GE, Telechron Dept.
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General Motors, Delco Div.
Giannini, G. M.
Globe Industries
Haydon Co., A. W.
Holtzer-Cabot
Howard Industries
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MOUNTINGS, Shock and Vibration Absorbing

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Suffolk Products
Tinnerman Products
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MOUNTS, Thermistor, see Thermistor Mountings

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MULLENTESTERS, see Bursting Test Machines

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MULTIPLE SCALE METERS, see Electrical Indicators

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Feller Engrg.
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Norden-Ketay
Peschel Electronics
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Thordarson Electric
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CONTENTS

Chapter I. Nuclear Reactor Types
Chapter II. Availability and Selection
Chapter III. Radioactivity Measurement
Chapter IV. Radiation Protection
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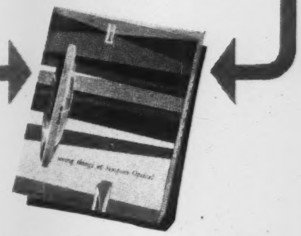

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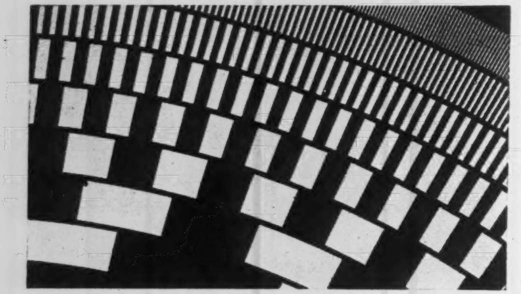

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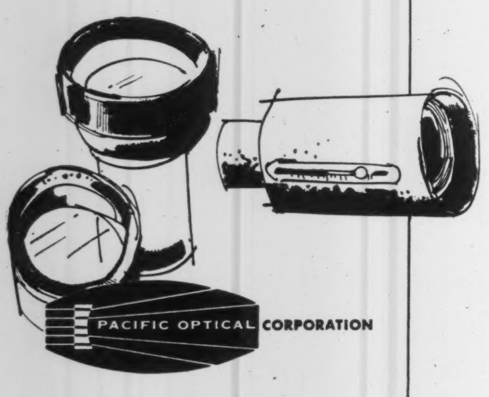

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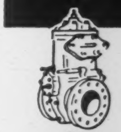

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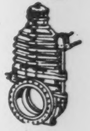

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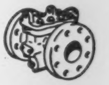

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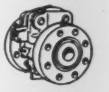

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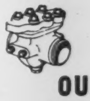

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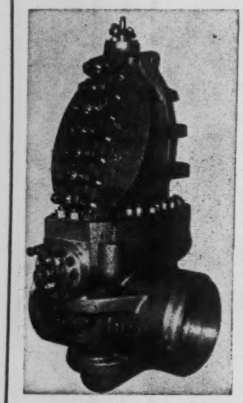

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Vectron, Inc.
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Waterman Products
Waveforms, Inc.
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Wiancko Engrg. Co.

OSCILLATORS, Microwave

Airborne Instr.
Amerac, Inc.
Amer. Electroneering
Avion Div.
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C.G.S. Labs.
Clough-Brengle
Daystrom Inst.
DuMont Labs., Allen B.
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Farnsworth Electronics
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Kahn & Co.
Kay Electric
Kearfott Co.
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Lavoie Labs.
Manson Labs.
Marconi Instruments
Maxson Instr. Div.
Maxson Corp.
Microwave Assocs.
Narda Corp.
New London Instr. Co.
Polarad Electronics
Polytechnic Res. & Dev.
RCA Div.
Radio Receptor Co.
Ramo-Wooldridge
Raytheon Mfg.
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Servo Corp. of Amer.
Sierra Electronic Corp.
Sperry Gyroscope
Std. Electronic Res.
Thordarson-Meissner
Varian Assocs.
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Webber Aircraft Corp.
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OSCILLATORS, Radio-frequency

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Alto Scientific
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Amer. Electroneering
Audio-Tone Oscillator
Authorized Mfrs. Service
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DuMont Labs., Allen B.
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Electronic Instr. Co.
Electronic Mfg. Co.
Electronic Measmts. Corp.
El-Tronics, Inc.
Engineering Res. & Devel.
Farnsworth Electronics
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Feiler Engrg. Co.
Ferris Instr. Co.
Freed Transf. Co.
GE, Electronics Div.
General Electronic
General Radio Co.
Georator Corp.
Hall Sonic Engrg. Co.
Harvey Radio Labs.
Hewlett-Packard
Hickok Electcl. Instr. Co.
Hycon Electronics, Inc.
Internat. Crystal Mfg. Co.
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Lavoie Labs.
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Lyman Electronics
Manson Labs.
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Millen Mfg. Co.
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New London Instr. Co.
Pacific Div.
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Polytechnic Res. & Dev.
Precise Devel. Corp.
Precision Apparatus Co.
Premier Res. Labs.
RCA Tube Div.
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Radio Receptor Co.
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Raytheon Mfg. Co.
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Rollin Co.
Servo Corp. of Amer.
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Sierra Electronic Corp.
Simpson Electric
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Sylvania Elect. Prods.
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Teletronics Lab.
Televiso Corp.
Telonic Industries
Thordarson-Meissner
Transval Engrg. Corp.
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Vari-L Company, Inc.
Vectron, Inc.
Virginia Electronics
Walkirt Co.
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Waveforms, Inc.
Webber Aircraft Corp.
Wilmar Mfg. Co.

OSCILLATORS, Ultrasonic

Amer. Electronic Labs.
Atlantic Research
Branson Insts., Inc.
Brush Electronics
Clough-Brengle
Corbett Science Labs.
Devtronics, Inc.
Diatron Co.
Donner Scientific
DuMont Labs., Allen B.
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Engineering Res. & Devel.
Farnsworth Electronics
GE
Gen. Prec. Lab.
General Radio
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Hycon Elect.
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Martin Sweets Co.
McKenna Labs.
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Neucor, Inc.
Oltronix Co.
Photocon Research
Radio Receptor Co.
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Southw. Indust. Electronic
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Sperry Products
Teletronics Lab.
Thordarson-Meissner
Virginia Electronics
Waveforms, Inc.

OSCILLOGRAPHS, Cathode-ray, see Oscilloscopes

OSCILLOGRAPHS, Moving-conductor

Allied Products Div.
Baldwin-Lima-Hamilton
Brush Electronics
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Consol. Electronics
Corbett Science Labs.
Edin Electronics
GE
Georator Corp.
Hamilton Watch
Hathaway Instr. Co.
Heiland Div.
Opplem Co.
Sanborn Co.
Waterman Products
Westinghouse Electric

OSCILLOGRAPHS, Multi-element

Acton Labs.
Alden Products
Allied Products Div.
Allegany Instr. Co.
Baldwin-Lima-Hamilton
Beam Instrument
Brush Electronics
Cambridge Instr. Co.
Century Electronics
Century Geophysical
Coleman Instr. Co.
Consol. Electrodynamics
Corbett Science Labs.
Edin Electronics
Electro-Medical Lab.
Electro-Tech Equipt.
Engineering Labs., Inc.
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Feiler Engrg. Co.
GE, Apparatus Sales
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Techno Inst. Co.
Texas Insts., Inc.
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OSCILLOGRAPHS, Piezo electric

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Cambridge Instr. Co.
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Electro-Medical Lab.
Engineering Labs.
Georator Corp.
McFarlin Co.
Pimex, Inc.
Waterman Products

OSCILLOGRAPHS, Recording

Acton Labs.
Allen Products
Allegany Instrument Co.
Allied Prods. Div.
Amelco, Inc.
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Brush Electronics
Cambridge Instr. Co.
Central Research Labs.
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Consol. Electrodynamics
Corbett Science Labs.
Du Mont Labs.
Edin Co.
Electro-Medical Labs.
Electro-Products Lab.
Electronic Tube Corp.
Engineering Labs., Inc.
E[illegible]c, Inc.
GE Apparatus Sls.
General Radio Co.
Genisco, Inc.
Geotechnical Corp.
Gilman Scientific Instr.
Grass Instr. Co.
Hamilton Watch
Hathaway Instr. Co.
Heiland Division
Houston Technical Labs.
Hycon Electronics, Inc.
Martin-Hubbard
Massa Labs.
Mid-Century Instrumatic
Midwestern Instruments
Miller Instruments
Offner Electronics
Opplem Co.
Photron Instr. Co.
Rahm Instruments
Reed Research, Inc.
Sanborn Co.
Sound Apparatus Co.
Southw. Indust. Electronic
Technical Insts. Inc.
Technology Instrument
Telecomputing Corp.
Texas Insts., Inc.
Triumph Mfg. Co.
United Electrodynamics
Victor Lab.
Waterman Products
Weber Aircraft Corp.
Westinghouse Electric
Wollensak Optical

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Browning Labs.
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Philco Corp.
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Simpson Electric
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Sylvan Electronic Labs.
Sylvania Elect. Prods.
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Triumph Mfg.
Ultrasonic Engrg. Co.
Vanguard Instr. Co.
Volkers & Schaffer
Waterman Products
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Weston Electcl. Instr.

OSMIUM

Amer. Platinum Wks.
Bishop & Co., J.
Brush Electronics
Duotone Co.
Secon Metals Corp.

OUTPUT METERS, see Sound Level, also Electrical Indicators

OVENS, Controlled Atmosphere

Amer. Gas Furnace Co.
Amer. Instr. Co.
Amer. Research Corp.
Blue M. Electric
Distillation Products
DoAll Co.
Electric Hotpack Co.
Gordon Co., Claud S.
International Radiant
Kahle Engrg. Co.
Kirk & Blum
L & L Mfg. Co.
Labline, Inc.
Laboratory Equipt. Corp.
McCoy Electronics
Modern Lab. Equipt. Co.
Natl. Appliance Co.
Pacific Scientific
Precision Scientific
Res. Appliance Co.
Rockwell Co., W. S.
Sodemann Heat & Power
Surface Combustion Corp.
Temp. Engrg. Inc.
Tenney Engrg., Inc.
Wakefield Industries

OVENS, Crystal Oscillator

Amer. Research Corp.
Bliley Electric
Blue M Electric
Electric Hotpack Co.
Erwood, Inc.
Federal Telephone & Radio
Hupp Electronics
Knights Co.
L & O Research
Lavoie Labs.
McCoy Electronics
Premier Res. Labs.
RCA Div.
Robertshaw-Fulton
Telectronics Lab.
Temp. Engrg. Corp.
Tenney Engrg., Inc.
Valpey Crystal Corp.

OVENS, Laboratory (see also Furnaces)

Ace Glass Co.
Aloe Co., A. S.
Amer. Gas Furnace Co.
Amer. Instr. Co.
American Research Corp.
Auto Control Labs.
Blue M Electric
Boekel & Co.
Brabender Corp.
Braun Corp.
Burrell Corp.
Bush Assocs.
Central Scientific
Dietert Co.
Electric Heat Control
Electric Hotpack Co.
Falstrom Co.
Federal Telephone & Radio
Ferner Co.
Fischer Scientific
General Biological
Gordon Co., Claud S.
Grieve-Hendry
Humboldt Mfg.
Huppert Co.
K. & H. Indust. Prods.
Kahle Engrg. Co.
Kearfott Co.
Kirk & Blum
L & L Mfg. Co.
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Lab. Equipt. Corp.
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Lucifer Electric
Martin & Co.
Metalab Div.
Modern Elect. Lab.
Modern Lab. Equipt. Co.
Natl. Appliance Co.
Pacific Scientific
Phipps & Bird
Physics Research
Precision Scientific
Res. Appliance Co.
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Sargent & Co.
Seedburo Equipt. Co.
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Standard Science Supp.
Standard Scientific
Steiner-Ives
Stoelting Co.
Surface Combustion Corp.
Temp. Engrg. Corp.
Tenney Engrg. Inc.
Testing Machines, Inc.
Thermador Electcl. Mfg.
U. S. Testing Co.
Wakefield Industries
Welch Mfg. Co., W. M.

OVENS, Precision Calibration

Amer. Instr. Co.
Amer. Mach. & Fdry. Co.
Blue M Electric
Bowser, Inc.
Central Scientific
Cooley Elect. Mfg.
Despatch Oven Co.
Drying Systems, Inc.
Eclipse Fuel Engrg. Co.
Electric Hotpack Co.
Falstrom Co.
Gallien, R. P.
Grieve-Hendry
Huppert Co., K. H.
Kirk & Blum
Knights Co., James
L & L Mfg. Co.
Modern Lab. Equipt.
Phipps & Bird
Precision Scientific
Temp. Engrg. Corp.
Tenney Engrg., Inc.
Testing Machines
Valpey Crystal
Young Brothers

OVENS, Testing and Aging

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Auto Control Labs.
Blue M Electric
Bristol Engrg. Labs.
Electric Hotpack Co.
Emerson App. Co.
Gordon Co., Claud S.
Grieve-Hendry
Kirk & Blum
L & L Mfg. Co.
Labline, Inc.
Mid-Century Instrumatic
Modern Lab. Equipt. Co.
Natl. Appliance Co.
Precision Scientific
Res. Appliance Co.
Rockwell Co., W. S.
Scott Tester, Inc.
Surface Combustion Corp.
Temp. Engrg. Corp.
Tenney Engrg., Inc.
U. S. Testing Co.

OVER and UNDER-WEIGHT INDICATORS FOR BEAM SCALFS, see Weighing Scales

OXIDATION-REDUCTION POTENTIAL INSTRUMENTS, including Detectors

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Foxboro Co.
Scientific Instr. Co.
Wallace & Tiernan

OXYGEN ANALYZERS, see Gas Analyzers

OXYGEN REGULATORS, Aircraft, including Demand Valves

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Bastian-Blessing
Bendix, Eclipse-Pioneer
Bendix, Pioneer-Central
Black Mfg.
Gadgets, Inc.
Gaertner Scientific
Grove Valve & Reg.
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Linde Air Products
Mine Safety Appliances
Mira Scient. Insts.
Robertshaw-Fulton

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Crown Indust. Prods.
Du Pont
Metal & Thermit Corp.
Micro-Circuits Co.
Photo Chemical Prods.
Sherwin-Williams Co.
Switzer Bros.
Walden Electronics

PAINT, Conductive

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DuPont
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Micro-Circuits Co.
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Sauereisen Cement Co.
Torrance Glass & Color

PAINT, Changing Color with Temperature, see Temperature-Sensitive Paint

PAINT TEST INSTRUMENTS, including Hiding Power, Film Thickness, etc.

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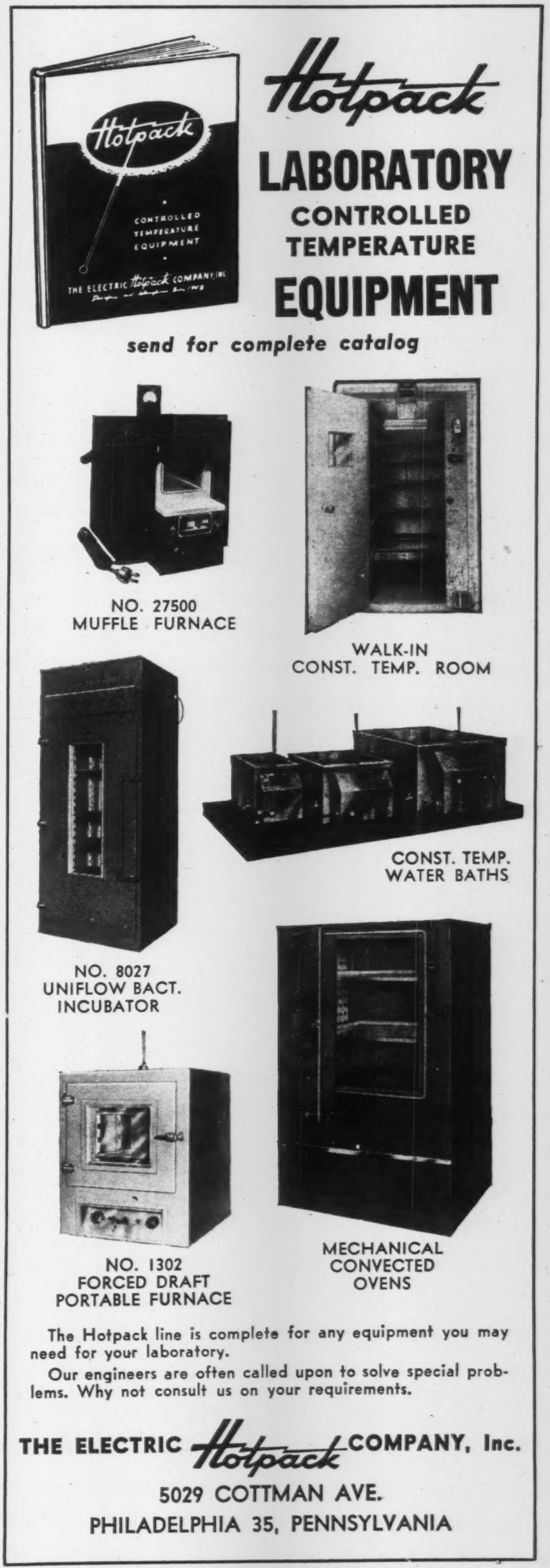

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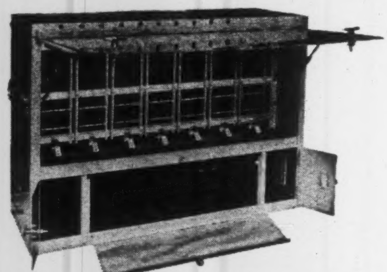

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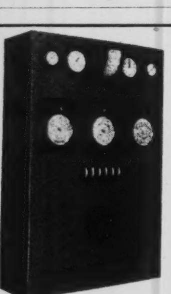

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Taber Instr. Co.
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Universal Aviation
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Weiber Corp.
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Barber-Colman
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Berkshire Labs
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Nems-Clarke, Inc.
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Palos Optical Co.
Panellit, Inc.
Park Nameplate Co.
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Penn Insts Div.
Photo Chemical Prods.
Pneumafil Corp.
Premier Metal Prods. Co.
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Taller & Cooper
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Craig Systems, Inc.
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Gustaveson, Inc.
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Maryland Etching Co.
Maymer Corp.
Mica Insulator
Miller Dial & Name Pl.
Molded Insulation Co.
Moss & Co., Henry
Palos Optical Co.
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Bunnell Co.
Cal-Tronics Corp.
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Dietz Co., Henry G.
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Instr. Devel. & Mfg. Corp
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Karp Metal Products
Lear, Inc.
Miller Dial & Name Pl.
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Premier Metal Prods.
Radiaphone Co.
Reiner Electronics
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Simpson Electric
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Bristol Co.
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Engrg. & Research Corp.
Falstrom Co.
Fischer & Porter Co.
Gustaveson, Inc.
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Kay Lab
Keller Products
Lake Erie Electric
Reiner Electronics
Scientific Instr. Co.
Suffolk Products
Swanson Engrg. Co.
Texas Apparatus Co.
Wolfe & Mann

PANORAMIC ADAPTERS, see Spectrum Analyzers

PANTOGRAPHS

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Dittmore & Freimuth
Gaertner Scientific
Gordon Enterprises
Gorton Mach. Co., George
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Jerpbak-Bayless
Keuffel & Esser
Los Angeles Scient. Instr.
Mico Instr. Co.
New Hermes, Inc.
Newmatic Corp.
Physics Research
Preis Engraving Mach.
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Warren-Knight
Weber Co.

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Amer. Instr. Co.
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Dietert Co.
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Photovolt Corp.
Precision Scientific
QOS Corp.
Riehle Div.
Scott Co., Henry L.
Scott Testers, Inc.
Sheffield Corp.
Speidel & Co.
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Suter, Alfred
Sweets Co., Martin
Taber Instr. Co.
Testing Machines, Inc.
Thwing-Albert
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U. S. Testing Co.
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Koehler Instr. Co.
Labline, Inc.
Olsen Testing Mach.
Perkins & Son
Precision Scientific
Technical Equipt. Co.
Thwing-Albert
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Central Scientific Co.
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Fisher Scientific
Franklin Electronics
GE, Apparatus Sales
Meyer & Co., Hugo
Mine Safety Appliances
Opplem Co., Inc.
Palo Lab. Supplies
Phoenix Prec. Instr.
Precision Scientific
Weber Gage Co.

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Keuffel & Esser
Weber Co.
Zeiss, Inc., Carl

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Keuffel & Esser
Testrite Instr. Co.
Warren-Knight
Weber Co.
White Co., David

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SperryGyroscope
Stafford Co.
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Warren-Knight

PENDULUM MACHINES, see Impact Test

PENETROMETER NEEDLES, see Asphalt Testing Apparatus

PENS, Recorder, see Recorder Pens

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Bronoptics Co.
Brooke Engrg. Co.
Buhl Optical
Ess Instr Co.
Fecker, Inc.
Gaertner Scient. Corp.
Helio Instr. Co.
Kollmorgen Optical
Lab. Optical Co.
Lenox Instr. Co.
Mann Co., W. I.
McNeill Engrg. Co.
National Elect. Instr.
Penberthy Instr. Co.
Perkin-Elmer
Testa Mfg. Co.
Tinsley Labs.
Unertl Optical
Zenith Optical

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Bausch & Lomb
Bray Optical
Bronoptics Co.
Brooke Engrg. Co.
Buchele, W.
Buhl Optical
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Davidson Mfg. Co.
Edmund Scientific
Farrand Optical
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Gaertner Scientific
Gordon Enterprises
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Norden-Ketay
Opplem Co.
Owens-Illinois
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Perkin-Elmer
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Unertl Optical
Wild Heerbrugg
Zenith Optical

PERMANENT MAGNETS, see Magnets

PERMANENT-MAGNET MOVING-COIL MOVEMENTS, see D'Arsonval Movements

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Fisher Scientific
GE
Hathaway Instr. Co.
Leeds & Northrup
Rawson Electcl. Instr.
Rese Engrg. Co.
Rubicon Co.
Sensitive Res. Instr.
Sunshine Scientific
Welch Scientific

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Fisher Scientific
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Humboldt Mfg. Co.
Precision Scientific
Ruska Instr. Corp.
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Thwing-Albert

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Boekel & Co.
Brabender Corp.
Brooks Rotameter
Brush Electronics
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Consol. Electrodynamics
Cook Research Labs.
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Eitzen Co., Louis C.
Ercona Corp.
Fish-Schurman
Fisher Scientific
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Gardner Laboratory
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Greiner Co., Emil
Greiner Glassblowing Lab.
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Foxboro Co.
General Controls
GE, Instr. Dept.
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Lapp Insulator
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Macbeth Corp.
Manning, Maxwell & Moore
Minneapolis-Honeywell, Indust. Div.
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Servomechanisms, Inc.
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Machlett & Son
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Martin & Co.
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Photovolt Corp.
Precision Scientific
Rascher & Betzold
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Rowe Radio Research
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Sargent & Co.
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Specialty Glass Co.
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Davenport Mfg. Co.
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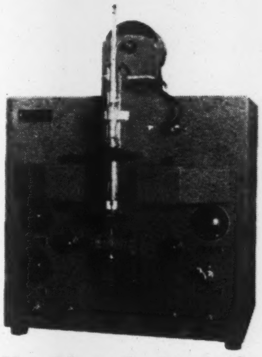

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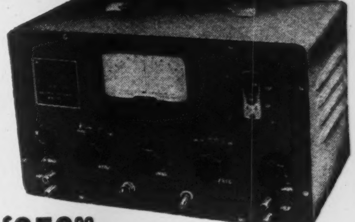

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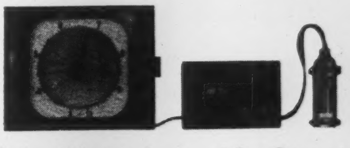

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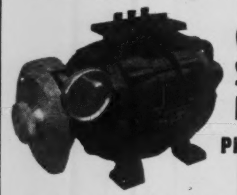

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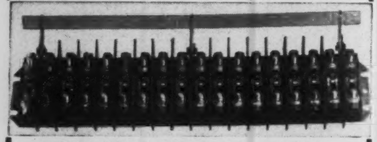

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Electron-Radar Prods.
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Fredericks, George
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Hughes Aircraft
Hupp Electronics
Instruments Devel. Labs.
International Rectifier
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Electronic Prods. Co.
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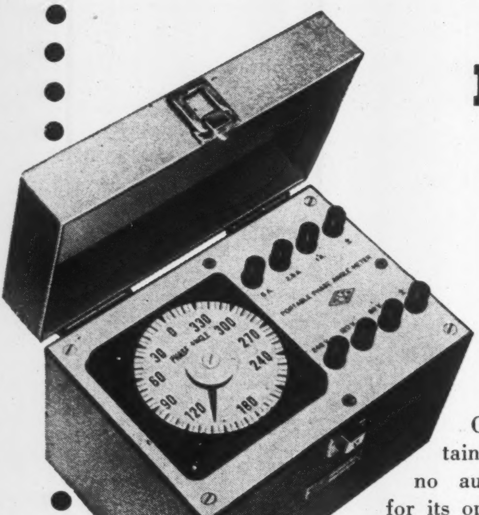
PORTABLE PHASE ANGLE METER



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Shepard Labs.
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Bausch & Lomb
Biddle Co., James G.
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Bristol Co.
Cambridge Instr. Co.
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Eastman Kodak Co.
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Epic, Inc.
Ercona Corp.
Ess Instr. Co.
Farrand Optical
Ferner Co.
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Shepard Labs.
Stinco Div.
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Ultrasonic Engrg. Co.
United Engineers
Vectron, Inc.
Weksler Thermom. Corp.
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Williams, Brown & Earle
Zeiss, Inc., Carl

PHOTOMETERS, Miscellaneous including Bar, Candle, Flame, Flicker, Neutral Wedge, Sphere, etc. see also Illumination Instruments)

Agfa Ansco
Aloe Co., A. S.
American Electronic Labs.
Amer. Instr. Co.
Amer. Optical
Applied Physics Corp.
Avion Div.
Baird Assocs.-Atomic
Barclay Instr. Div.
Bausch & Lomb
Beckman Instruments
Biddle Co., James G.
Central Scientific
Chapman Labs.
Coleman Insts., Inc.
Davidson Mfg. Co.
DeJur-Amsco
Dietert Co.
Electro-Physics
Electro-Tech Equipt.
Ercona Corp.
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Gaertner Scientific
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GE, Apparatus Sales
GE, Lamp Dept.
G. M. Laboratories
Hickok Electcl. Instr.
Houston Fearless Corp.
Instrument Devel. Labs.
Jarrell-Ash
Kauffman-Lattimer
Kruger Instruments
Leeds & Northrup
Leitz, Inc.
Librascope, Inc.
Macalaster Bicknell
Macbeth Corp.
Marion Electcl. Instr.
Meyer Opticraft
North Amer. Philips
Patwin Insts. Div.
Perkin-Elmer
Pfaltz & Bauer
Phoenix Prec. Instr.
Photo Research
Photovolt Corp.
Prec. Thermom. & Insts.
Process & Instruments
Rockwell Engrg. Co.
Rudolph & Sons, O. C.
Scientific Specialties
Servo Corp. of Amer.
Triplett Electcl. Instr.
Ultrasonic Engrg. Co.
Welch Mfg. Co., W. M.
Zeiss, Inc., Carl
Zoomar Corp.

PHOTOMETERS, Photoelectric, see Illumination Instruments

PHOTOMETERS, Reflection

Agfa Ansco
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Amer. Instr. Co.
Bausch & Lomb
Beckman Div.
Ercona Corp.
Farrand Optical
Fish-Schurman
Gaertner Scientific
Gardner Laboratory
Instrument Devel. Labs.
Kaye Devel. Co.
Macbeth Corp.
Mann Co., Wm. I.
Munsell Color Co.
Pfaltz & Bauer
Phoenix Prec. Instr.
Photo Res. Corp.
Photovolt Corp.
Rubicon Co.
Rudolph & Sons, O. C.
Welch Mfg. Co., W. M.
Zeiss, Inc., Carl
Zoomar Corp.

PHOTOMETERS, Spectro, see Spectrophotometers

PHOTOMETERS, Ultraviolet

Agfa Ansco
Bausch & Lomb
Beckman Div.
Burt Scientific Labs.
Farrand Optical
Gaertner Scientific
GE
Jarrell-Ash
Kruger Insts., Harold
Leeds & Northrup
Mine Safety Appliances
Perkin-Elmer
Pfaltz & Bauer
Phoenix Prec. Instr.
Photovolt Corp.
Process & Instruments
Rubicon Co.
Servo Corp. of Amer.
Welch Mfg. Co., W. M.

PHOTO-MICROGRAPHIC EQUIPMENT, see Microscopes

PHOTOTUBES and PHOTOCELLS, see Tubes, Photosensitive

PHYSICAL TESTING MACHINES for Compression and Tension, see Testing Machines, Universal

PICKUPS, see Object of Measurement (Displacement, Speed, Temperature, etc.)

PICKUPS, Crystal, see Crystals

PICKUPS, Capacitance Type, see Displacement Pickups, Capacitance Type

PICKUPS, Differential Transformer, see Displacement Pickups, Differential Transformer

PICKUPS, Magnetic and Reluctance, see Displacement Pickups, Magnetic

PICKUPS, Motion, see Displacement Pickups

PICKUPS, Potentiometer, see Potentiometer (Resistor), also Displacement Pickups

PICKUPS, Photoelectric, see Photoelectric Cells, also Tubes, Photosensitive

PICKUPS, Radiation Sensitive, see Radiation Pickups

PICKUPS, Resistive, see Potentiometers (Resistors), also Displacement Pickups

PICKUPS, Thermocouple-type, see Thermocouples

PIEZOMETERS

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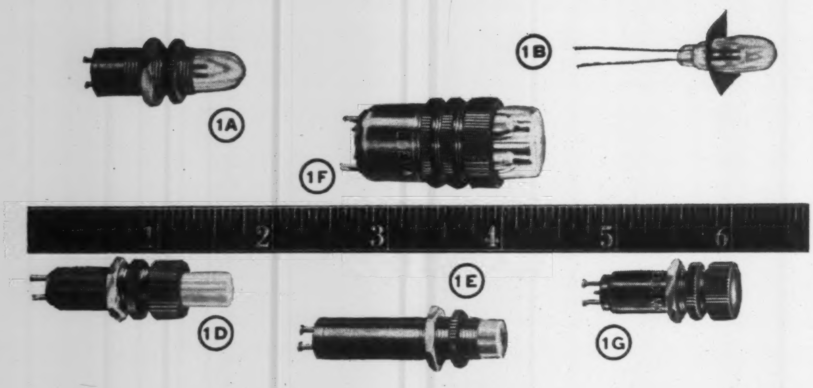

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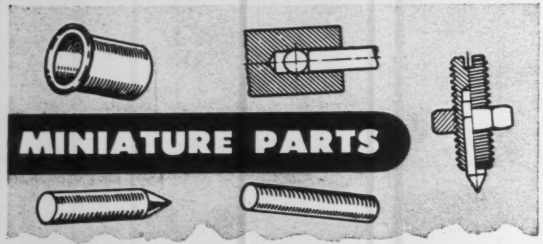

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Croname, Inc.
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Eldema Corp.
Federal Screw Prods. Co.
Foxboro Co.
General Control
GE, Lamp Dept.
Gervos Instruments
Gothard Mfg. Co.
Hart Mfg. Co.
Hetherington Inc.
Industrial Devices, Inc.
Johnson Co., E. F.
Kirkland Co., H. R.
Kulka Electric
Lewyt Corp.
Lindly & Co.
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Molded Insulation
National Tel-Tronics
Panellit, Inc.
Rodale Mfg. Co.
Rohm & Haas
SCAM Instr. Co.
Signal Indicator Corp.
Sittler Corp.
Sylvania Elect. Prods.
Taylor Instr. Cos.
Ucinite Co.
Universal Aviation Equipt.
Waltham Precision Tool
Westinghouse Electric

PILOTS, Automatic, see Aircraft Instruments

PINIONS, Precision, see Gears

PIPE FITTINGS, see Fittings

PIPE LOCATORS, see Metal Detectors

PIPE and TUBE TESTING MACHINES

Alloy Tube Div.
Baldwin-Lima-Hamilton
Black & Decker
Branson Instruments
Dillon & Co.
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Hacker & Co.
Industrial Engrg. Corp.
Kahn & Co.
King Tester Corp.
Krouse Testing Mach.
Magnaflux Corp.
Nuclear Research
Olsen Testing Machine
Riehle Div.
Steel City Testing Machs.
Whittington Pump

PIPELINE INSTRUMENTS, see Gas Distribution

PIPETTES, see Laboratory Apparatus

PISTON RING TESTERS, see Dimensional Gages

PITOT—PITOT-STATIC TUBES, Special, Aircraft Engine Testing, see Aircraft Instruments

PITOT TUBE METERS, see Flowmeters, Inferential

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Aeromarine Instr. Co.
Aerotech Specialties
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Amer. Meter Co.
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Custom Scientific Insts.
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Giannini & Co., G. M.
Hagan Corp.
Harco Labs.
Hays Corp.
Hill & Co., E. Vernon
Illinois Testing Labs.
Industrial Instr. Corp.
Kollsman Instr. Corp.
Leupold & Stevens
Manning, Maxwell & Moore
Mason-Neilan Div.
Meriam Instr. Co.
Minneapolis-Honeywell
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Penn Ind. Instr. Div.
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Prec. Thermom. & Insts.
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Revere Corp. of Amer.
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Trimount Instr. Co.

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Duotone Co.
Elgin National Watch
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Fansteel Metallurgical
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Moser Jewel Co.
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Precision Mfg. Co.
Precision Products Co.
Preco Co.
Simpson Electric
Specialty Screw Mach.
Sphinx Amer. Co.
Springfield Instr. Bear.
Stafford Co.
Steel Co., Herman D.
Swiss Jewel Co.
Swissomatic Prods.
Taylor Pivot Co.
Topp Industries
Torrington Co.
Triplex Machine Tool
Vallorbs Jewel Co.
Western Automatic Mach.
Whittington Pump
  & Engrg.
Wilder, Inc., R. S.
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PLANE TABLES, see Surveying Instruments

PLANIMETERS, Automatic Flow Recording

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Minneapolis-Honeywell
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PLANIMETERS, Linear and/or Radial (see also Integrators)

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Librascope, Inc.
Los Angeles Scient. Inst.
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Pacific Transducer Corp.
Physics Research
Serdex, Inc.
Speidel & Co.
United States Blue Print
Warren-Knight
Weber Co.
White Co., David

PLANIMETERS, Square Root

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Bailey Meter Co.
Dietzgen Co.
Foxboro Co.
Keuffel & Esser
Librascope, Inc.
Los Angeles Scient. Inst
Opplem Co., Inc.
Penn Insts. Div.
Speidel & Co.
Taylor Instr. Cos.
Weber & Co.
White Co., David

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Ann Arbor Instr. Works
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Brabender Corp.
Burrell Corp.
Bush Associates, G. F.
Custom Scientific Insts.
Dietert Co.
Dillon & Co.
Ferner Co.
Gardner Lab.
Gordon Co., Claud S.
Humboldt Mfg. Co.
Instron Engrg. Corp.
Moore Co., H. R.
Munsell Color Co.
Newage International
Olsen Testing Machine
Precision Scientific
Research Appliance Co.
Scott Testers, Inc.
Steel City Testing
Sweets Co., Martin
Taber Instr. Co.
Testing Machines, Inc.
Torsion Balance Co.
U. S. Testing Co.
Universal Aviation
Wilson Mech. Instr. Div.

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Scott Testers, Inc.
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PLATES, Name, see Nameplates

PLATINUM, Sheet, Foil, Gauze, Wire, etc., see Precious Metals

PLOTTER-FOLLOWERS, see Curve Followers, also X-Y Recorders, also Data Processing

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PLUGS, JACKS and RECEPTACLES, see Connectors

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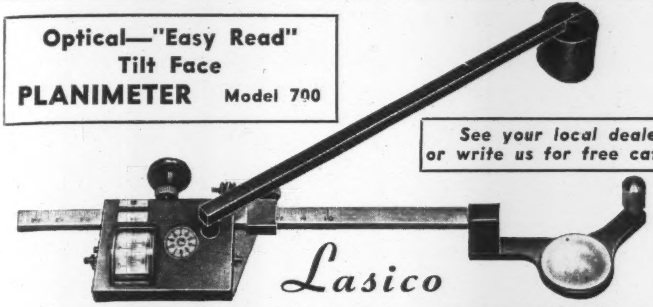
Mansfield & Green
Marsh Corp., Jas. P.

POINTERS and DIALS, FLUORESCENT, see Dials and Pointers, Fluorescent



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Gaertner Scientific
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POLARISCOPE TUBES, see Tubes, Polariscope

POLARISCOPES, including Photo elasticity, Wool Testing

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Chapman Labs.
Fish-Schurman
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Pacific Transducer Corp.
Triplett Electcl. Instr.
Weston Electcl. Instr.

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International Optical
Lab. Optical Co.
Merry Instr. Co.
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Polaroid Corp.
Regal Instr. Co.
Rudolph & Sons

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Dearborn Scientific
Enteco Industries
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Gaertner Scientific
Graf-Apsco
Merry Instr. Co.
Opplem Co., Inc.
Pacific Transducer Corp.
Polarizing Instr. Co.
Regal Instr. Co.
Rudolph & Sons
Zeiss, Inc., Carl

POLISHING MACHINES, see Machines, Polishing

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PORCELAIN, Laboratory, see Laboratory Apparatus

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POSTS, BINDING, see Connectors

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Associated Research
Bristol Co.
Burton Mfg. Co.
Donner Scientific
Feiler Engrg. Co.
GE
Georator Corp.
Industrial Test. Equipt.
Littelfuse Inc.
Peschel Electronics
Sensitive Res. Instr.
Varo Mfg. Co.
WacLine, Inc.
Westinghouse Electric

POTENTIAL DIVIDERS, see Potentiometers (Resistors)

POTENTIOMETERS, Manually-balanced

Aerovox Corp.
AiResearch Mfg. Co.
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B & H Instr. Co.
Centralab Div.
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Howell Instr. Co.
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Rubicon Co.
Thermo-Electric Co.
Thwing-Albert
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Allen-Bradley
American Electronics
Amer. Instr. Co.
Arma Div.
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B & H Instr. Co.
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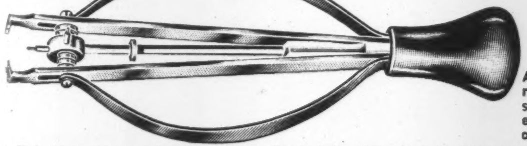

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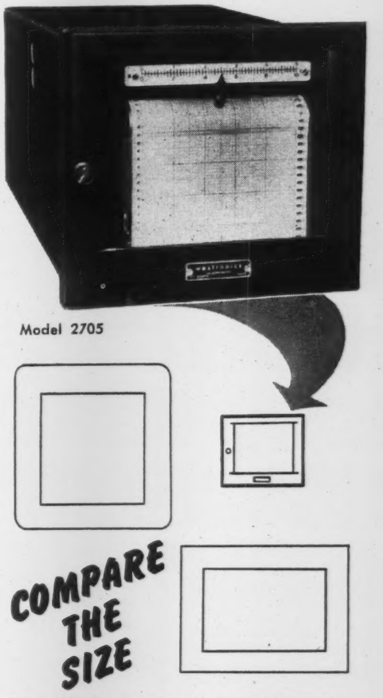
This revolutionary recorder saves you two ways . . . fits in a small space (only 9⅝ inches wide and 8½ inches tall) and costs less.



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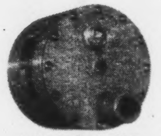

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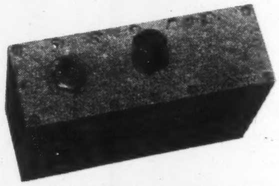

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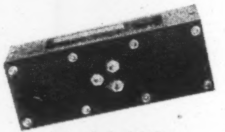
Output



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High Range
(1000-10,000 PSI)

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POTENTIOMETERS
(Resistors), Linear Motion, see Displacement Pickups

POTENTIOMETERS, (Resistors), Linear and Non-Linear, Precision

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Amer. Electronics
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Ford Engrg. Co.
Ford Instr. Co.
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Helipot Div.
Howell Instr. Co.
Humphrey, Inc.
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International Resistance
Jarvis Electronics
K-F Devel. Co.
Kearfott Co.
Lectronic Research
Leeds & Northrup
Librascope, Inc.
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Norden-Ketay
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Pacific Scientific
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Precision Line Inc.
Precision Resistance
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Rattray & Co.
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Rex Rheostat
Rubicon Co.
San Fernando Elect. Mfg.
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Spectrol Corp.
Technology Instr. Div.
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Computer Insts. Corp.
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Daystrom-Pacific
DeJur-Amsco
Electro-Mec Laboratory
Fairchild Conts. Corp.
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Helco Prods. Corp.
Helipot Div.
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Waters Mfg., Inc.
Wirt Co.

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Borg Equipt. Div.
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Computer Insts. Corp.
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Ford Engrg. Co.
General Controls Co.
Giannini & Co.
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Bristol Electronic Dynamaster (R) Potentiometers will measure, record, or automatically control any variable that can be translated into an electrical quantity (d-c current, d-c voltage, capacitance, or resistance).

Offered in indicating, recording (up to 24 records on same chart), and controlling. All types of control: air operated, electric, electronic program control.

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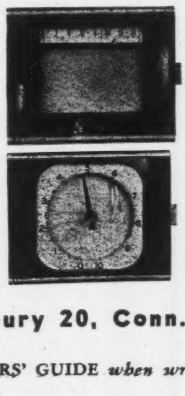

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Norden-Ketay
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Servonic Instruments
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Amer. Electronic Co.
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Black, Sivalls & Bryson
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Centralab Div.
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Electro-Mec Laboratory
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Cal-Tronics Corp.
Clough-Brengle
Cutler-Hammer
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Esterline-Angus
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Kay Lab.
Kearfott Co.
Leeds & Northrup
Marion Electcl. Instr.
Meters, Inc.
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RCA Div.
Reed Research
Sensitive Res. Instr.
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Sound Apparatus Co.
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Airpax Prods. Co.
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NEW! for missiles, fuzes, telemetering, airborne and portable equipment

VOLTAGE REGULATED DC SEMI-CONDUCTOR POWER TRANSFORMERS

HIGH-POWER
STANDARD
MINIATURE

Now available, a comprehensive range of INTERVERTERS, efficient semi-conductor power transformers from ¾ to 1 kilowatt. Input voltage from 1½ to 60 volts DC. Output—one or more filtered DC or controlled frequency AC voltages. Voltage regulated types available. Efficiencies up to 90%, weight and volume a small fraction of conventional rotating equipment. Meets applicable MIL specs for shock, acceleration and environment. Completely static, does not generate radio noise, undamaged by short circuits. Miniature series supplies plate and bias power from ¾ to 6 watts, for telemetering, missiles, beacons, fuzes and portable equipment. Standard series supplies power to 50 watts. High Power series to one kilowatt or more.

Interelectronics also produces high-rate reserve and rechargeable batteries for powering INTERVERTERS and other equipment.

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Vibration Res. Labs.
Victoreen Instr. Co.
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Walker Div.
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Western Gear Corp.
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Alfred Electronics
Amer. Electronics
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Arnoux Corp.
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Bristol Engrg. Corp.
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- R-313 is a thermosetting adhesive that cures at room temperature and needs no pressure. High electrical insulating properties.
- Non-porous—gives high pressure seals between metal and glass, plastics, etc.

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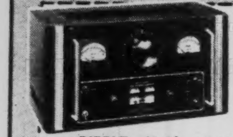
D.C. POWER SUPPLIES

For IMMEDIATE DELIVERY



OUTPUT

0-30 V.D.C.

5 Amps.

RIPPLE: ½% at Maximum Load
REGULATION: 1/10 Load, 34.5 V.
Full Load, 30.0 V.

RACK MODEL **KM75**
BENCH MODEL (Illus.) **KM75B**

Request Bulletin No. 93

OUTPUT

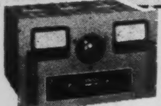
0-30 V.D.C.

10 Amps.

RIPPLE: 1% at Maximum Load.
REGULATION: 1/10 Load, 35 V.
Full Load, 30 V.

RACK MODEL (Illus.) **KM81**
BENCH MODEL **KM81B**

Request Bulletin No. 96



OUTPUT

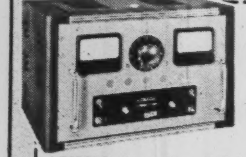
0-28 V.D.C.

20 Amps.

RIPPLE: 1% at Maximum Load.
REGULATION: 1/10 Load, 33 V.
Full Load, 28 V.

RACK MODEL (Illus.) **KM88**
BENCH MODEL **KM88B**

Request Bulletin No. 100



DUAL OUTPUT

0-32 V.D.C.

40 Amps.

0-64 V.D.C.

20 Amps.

RIPPLE: Less than 1%.
REGULATION: 1/10 Load, 36.5/73V
Full Load, 32.0/64V

RACK MODEL **KM95**
BENCH MODEL (Illus.) **KM95B**

Request Bulletin No. 103

UNFILTERED MODELS AVAILABLE

Request Bulletin No. 178

New O-PAC

Self-Contained DC Power Pack

OUTPUT

30 V.D.C. ± 6.5%

0-1 Amp.

MODEL
3150
$45.00

RIPPLE: Less than 1%.
INPUT: 115 V.A.C. 60 cy.
DIMENSIONS: 4¾x6x6⅝"

Request Bulletin No. 185

Opad ELECTRIC COMPANY

69-20 MURRAY STREET • NEW YORK 7, N. Y.
Telephone: BEekman 3-7548

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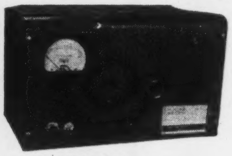
NEW! HIGH VOLTAGE RF POWER SUPPLIES

At Amazingly Low Cost

Regulated and Metered * Carefully Engineered
Built for Service * Input 117V — 60 Cycles

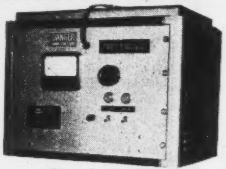
MODEL 75 BR
SIZE: 7¼x8x8
VOLTAGE RANGE:
2-7.5 KV-DC
CURRENT OUTPUT:
1 ma @ 6KV
REGULATION:
Better than 1% **$89.75**



MODEL 15 BR
SIZE: 7¼x12x8
VOLTAGE RANGE:
2-15 KV-DC
CURRENT OUTPUT:
1 ma @ 10 KV
REGULATION:
Better than 1% **$149.50**

MODEL 30BR
SIZE: 7¼x14x8
VOLTAGE RANGE:
5-30 KV-DC
CURRENT OUTPUT:
1 ma @ 20 KV
REGULATION:
Better than 1% **$199.50**

NEUTRONIC also manufactures a complete line of laboratory-type High Voltage Power Supplies—Rack-Mounted . . . Bench-Type Cabinets.



Standard Models

Model	Voltage Range	Current Range	Regulation
21K	1-10 KV	10 ma @ 5 KV	....
21KR	1-10 KV	10 ma @ 5 KV	½%
21M	1-12 KV	6 ma @ 10 KV	....
21MR	1-12 KV	6 ma @ 10 KV	½%
22C	3-26 KV	2 ma @ 18 KV	....
22CR	5-26 KV	2 ma @ 18 KV	½%

Model	Voltage Range	Current Range	Regulation
22M	5-30 KV	3 ma @ 20 KV	....
22MR	5-30 KV	3 ma @ 20 KV	½%
23C	5-40 KV	1.3 ma @ 25 KV	....
23CR	5-40 KV	1.3 ma @ 25 KV	½%
23M	5-45 KV	1.5 ma @ 30 KV	....
23MR	5-45 KV	1.5 ma @ 30 KV	½%
24C	5-50 KV	1 ma @ 35 KV	....
24CR	5-50 KV	1 ma @ 35 KV	½%
24M	5-50 KV	2 ma @ 30 KV	....
24MR	5-50 KV	2 ma @ 30 KV	½%
23S	3-35 KV	3 ma @ 30 KV	....
23SR	5-35 KV	3 ma @ 30 KV	½%
REVERSIBLE OUTPUT MODELS:			
R-21K	1-10 KV	10 ma @ 5 KV	....
R-21KR	1-10 KV	10 ma @ 5 KV	½%
R-22C	3-26 KV	2 ma @ 18 KV	....
R-22CR	5-26 KV	2 ma @ 18 KV	½%
R-22M	5-30 KV	3 ma @ 20 KV	....
R-22MR	5-30 KV	3 ma @ 20 KV	½%
R-22SR	5-30 KV	2 ma @ 30 KV	½%

Write to Dept. B for completely new catalog and price list.

NEUTRONIC ASSOCIATES

87-16 116th STREET **RICHMOND HILL 18, N.Y.** **VIrginia 7-7703**

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Electcl. & Phys. Instr.
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Electro-Pulse, Inc.
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Electronic Res. Assocs.
Electronic Rectifiers
Electronic Tube Corp.
Endevco Corp.
Engineered Magnetics
Fansteel Metallurgical
Fenway Mach. Co.
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Freed Transformer
Furst Electronics
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Gow-Mac Instr. Co.
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Hagan Corp.
Heller, Gerald K.
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Indust. Control Panel Co.
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Intercontinental Dynamics
Interelectronics Corp.
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North Hills Electric
Northeast Scient. Corp.
Opad Electric
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Peschel Electronics
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Plastic Capacitors, Inc.
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Rheem Mfg. Co.
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Specialized Instruments
Spellman Television
Stator Electric Corp.
Suffolk Products
Superior Electric
Sweets Co., Martin
Technic, Inc.
Techn. App. Builders
Teletronics Lab., Inc.
Thermador Electcl. Mfg.
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Transval Engrg. Corp.
Trio Labs., Inc.
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Univ. Atomics Corp.
Univ. Electronics Co.
Varo Mfg. Co.
Vibration Res. Labs.
Vickers Electric Div.
Victoreen Instr. Co.
Virginia Electronics
Walker Div.
Weber Aircraft Corp.
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POWER SUPPLIES, High Voltage

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Asch Equipt. Co.
Baird Assocs. Atomic Instr.
Berkeley Div.
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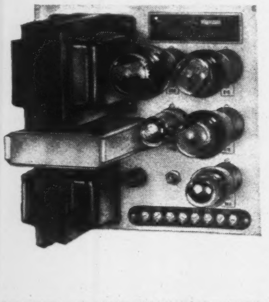

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The output voltage is continuously variable from 200 to 325 volts D.C. for load currents of 0 to 100 M.A. with an input voltage of 105 to 125 volts 60 cycle. Regulation is better than 1%. An isolated A.C. voltage of 6.3 volts at 3 amperes is available at the output terminal connections.

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where quality counts

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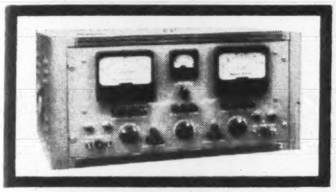

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Sorenson & Co.
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Sweets Co., Martin
Techn. App. Builders
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Tri-Tronics Co.
Univ. Atomics Corp.
Univ. Electronics Co.
Varian Assocs.
Vibration Research Labs.
Victoreen Instr. Co.
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Westinghouse Electric

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Amer. Electronics
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Bendix, Red Bank
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Devtronics, Inc.
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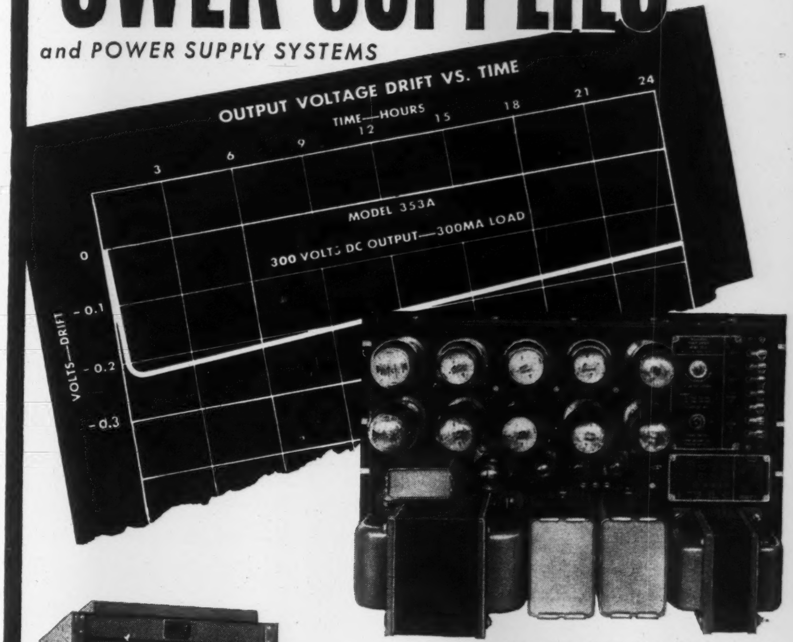
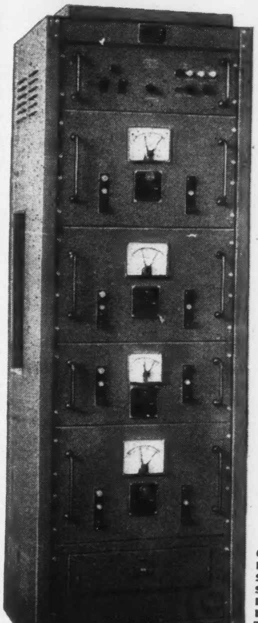
POWER SUPPLIES

and POWER SUPPLY SYSTEMS



300, 400 AND 500 MA CHASSIS



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RIPPLE: 100 microvolts to 1 millivolt.
RESPONSE TIME: 100 microseconds to 3 milliseconds.
INTERNAL IMPEDANCE: .05 ohms to 1 ohm.
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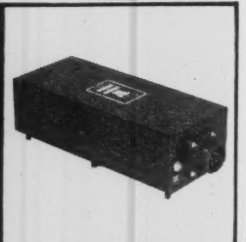

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Electronic Measmts Co.
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Empire Devices
Endevco Corp.
Engineered Electronics
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Fenway Mach. Corp.
Fluke Mfg. Co.
Franklin Electronics
Freed Transformer
Furst Electronics
GE, Apparatus Sales
General Magnetics
General Radio
Gow-Mac Instr. Co.
Green Rectifier Co.
Helipot Div.
Heller Co., G. K.
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Interelectronics Corp.
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Kalbfell Labs.
Kay Lab.
Keithley Instruments
Kemlite Labs.
Kepco Labs.
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Lessels & Assoc.
Levinthal Electron. Prods.
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MacLeod & Hanopol
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Magnetic Amplifiers, Inc.
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Manson Labs.
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Mercury Electronic Co.
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Natl. Instr. Labs.
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Neutronics Assocs.
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New Jersey Electronics
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Nuclear-Chicago
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Owen Labs.
Pac. Indust. Electronics
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PRESSES, Miniature Drill, see Machines, Drilling

PRESSES, see Machines

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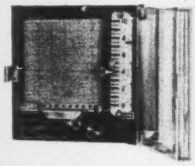

Bristol Metagraphic Recorder

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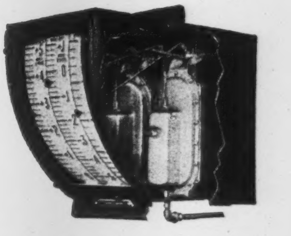

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National Time & Signal
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Powers Reg. Co.
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Prec. Thermom. & Insts.
Process & Instruments
Reliance Instr. Mfg. Corp.
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Soreng Products
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Yellow Springs Instr.

PRESSURE DIFFERENTIAL, see Flow or Level

PRESSURE DIFFERENTIAL TRANSMITTERS, Electric Output

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Automation Products
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Handley Electronics
Hastings-Raydist
Hays Corp.
Helco Products
Instruments Inc.
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Manning, Maxwell & Moore
Pace Engrg. Co.
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Reliance Instr. Mfg. Corp.
Schaevitz Engineering
Servonic Instruments
Simplex Valve & Meter Co.
Sparling Meter Co.
Sparton Cont. Systems
Statham Labs.
Swartwout Co.
Taber Instr. Corp.
Taylor Instr. Cos.
Trans-Sonics, Inc.
Uehling Instr. Co.
Ultradyne Engrg. Labs.
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Amer. Meter Co.
Assoc. Valve & Engrg.
Autoclave Engrs.
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Fischer & Porter Co.
Foxobro Co.
Hagan Corp.
Indust. Instr. Corp.
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Manning, Maxwell & Moore
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Penn Insts. Div.
Republic Flow Meters
Simplex Valve & Meter Co.
Squires Co.,C. E.
Taylor Instr.Cos.
Uehling Instr. Co.
United Electric Controls

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Autom. Temp. Contr. Co.
Bendix Aviation Corp.
B-I-F Industries
Bailey Meter Co.
Barton Instr. Co.
Bristol Co.
Consol. Electrodynamics
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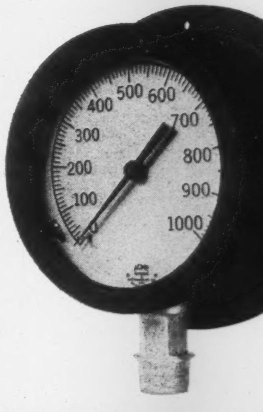
Trerice Co.
Trimount Instr. Co.
Uehling Instr. Co.
United Electric Controls
United Instr. Co.
U. S. Gauge Div.
Wallace & Tiernan
WekslerThermom. Corp.
Wiancko Engrg. Co.

PRESSURE GAGES, Absolute Pressure

Acme Gauge & Instr. Co.
Aeromarine Instr. Co.
Autom. Temp. Contr. Co.
B-I-F Industries
Bailey Meter Co.
Barton Instr. Corp.
Bendix, Eclipse-Pioneer
Berkeley Div.
Bristol Co.
Burton Mfg. Co.
Cameron Iron Works
Consol. Electrodynamics
Consol. Vacuum Corp.
Cook Electric
Crosby Steam Gage
Datran Engrg. Corp.
Distillation Products
Ellison Draft Gage Co.
Emery Co., A. H.
Endevco Corp.
Fairchild Conts. Corp.
Fischer & Porter Co.
Foxboro Co.
Fredericks Co., Geo.
GE
Giannini & Co.
Greenleaf Mfg. Co.
Greiner Co., Emil
Hastings-Raydist
Hathaway Instr. Co.
Hays Corp.
Heise Bourdon Tube Co.
Jerpbak-Bayless
King Engrg. Co.
Kistler Instr. Co.
Kollsman Instr. Corp.
Kontes Glass
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Div.
Meriam Instr. Corp.
Minneapolis-Honeywell
  Industrial Div.
Moeller Instr. Co.
Moore Products
Norden-Ketay
Penberthy Injector
Penn Insts. Div.
Prec. Thermom. & Insts.
Rahm Instr., Inc.
Republic Flow Meters

Acme Gauges



Precision built pressure gauges with standard or custom calibrated dials from 15 to 30,000 psi.
Cast iron and cast bronze cases in direct stem, wall, panel or flush mounting styles with dial sizes from 4½" to 12".

COMPLETE REPAIR SERVICE
ON ALL TYPES AND MAKES

Write for Bulletin 47A

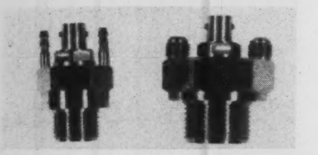
Acme Gauge & Instrument Co., Inc.
30 Main St. Brooklyn 1, N. Y.

For more information circle **278** on inquiry card.

Photocon Dynamic Pressure Systems

0.25-75,000 psig. 6000°F.

TRANSDUCERS
(CAPACITIVE TYPE)

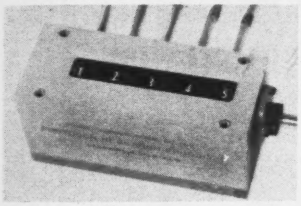


Static and dynamic pressures from 0.25 to 75,000 psig, water-cooled, for applications up to 6000° F. High natural frequency, stainless steel construction.

DYNAGAGE
DG-400

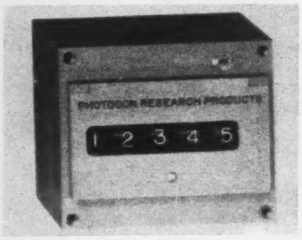
Simplified Tuning
Output ±15 Volts
0-20,000 C.P.S.
Cable Lengths Up To 1,000 Feet.

CONTROL COUNTERS



Precision Contacting and Potentiometer Counters for Telemetering and Control Systems.

MAGNETIC COUNTERS



HIGH-SPEED
MCP-505AS—5-Digit Combination Bi-Directional Add and Subtract Counter.
MCP-504SZL—4-Digit Subtracting Counter, Zero-Level Control Switch.

PHOTOCON RESEARCH PRODUCTS

421 N. ALTADENA DR.
WRITE FOR LITERATURE.
PASADENA, CALIF.
REF: 914

For more information circle **279** on inquiry card.

Rochester Mfg. Co.
Scientific Glass App.
Scientific Instr. Co.
Servomechanisms, Inc.
Statham Labs.
Taylor Instr. Cos.
Technical Equipt. Co.
Trans-Sonics, Inc.
Trerice Co.
Trimount Instr. Co.
Uehling Instr. Co.
Ultradyne Engrg. Labs.
U. S. Gauge Div.
Vacuum-Electron Engrg.
Wallace & Tiernan
Weksler Thermom. Corp.
Weston Electcl. Instr.
Wiancko Engrg. Co.

PRESSURE GAGES, Chemical

Autoclave Engrs.
B-I-F Industries
Bristol Co.
Crosby Steam Gage
Foxboro Co.
Heise Bourdon Tube Co.
Helicoid Gage Div.
Lonergan Co.
Manning, Maxwell & Moore
Mansfield & Green
Mason-Neilan Div.
Minneapolis-Honeywell Indust. Div.
Morehouse Machine Co.
Pressure Prod. Industries
Scientific Instr. Co.
Uehling Instr. Co.
United Instr. Co.
U. S. Gauge Div.
Weksler Thermom. Corp.

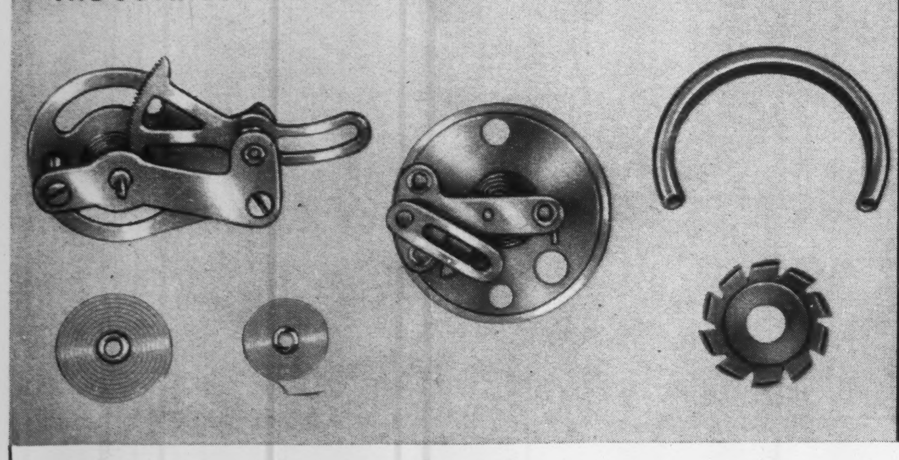
PRESSURE GAGES, Indicating

Ace Glass Inc.
Acme Gauge & Instr.
Aeromarine Instr. Co.
Aeroquip Corp.
Amer. Meter Co.
Ann Arbor Instr. Works
Atlantic Research
Autoclave Engrs.
Autom. Temp. Contr. Co.
Aviation Engrg. Co.
Bacharach Industrial Instr.
Bailey Meter Co.
Baird Assocs.-Atomic Instr.
Baldwin-Lima-Hamilton
Bastian-Blessing
Beacon Gage Co.
Bendix, Eclipse-Pioneer
Bendix-Pacific
Berkeley Div.
Beta Corp.
Bethlehem Apparatus
Block Mfg. Co.
Boekel & Co.
Bristol Co.
Builders-Providence
Burton Mfg.
Cameron Iron Works
Central Scientific
Century Instr. Co.
Clark Blast Meter
Cleveland Fuel Equipt.
Cole Instr. Co.
Coleman Instr. & Mfg.
Commercial Research
Consol. Electrodynamics
Continental Electric
Crosby Steam Gage
Datran Engrg. Co.
Dayton-Rogers Mfg. Co.
Daytronic Corp.
Decker Aviation
Designers for Industry
Diatron Co.
Dickson Co.
Dillon & Co.
Distillation Products
Douglas Radio Labs.
Dwyer Mfg. Co.
Edcliff Instruments
Edison, Inc., Thomas A.
Electric Auto-Lite
Electro-Mec Lab.
Electric Prod. Labs.
Elematic Equipt. Corp.
Ellison Draft Gage
Emery Co., A. H.
Endevco Corp.
Engineering Res. & Devel.
Esterline-Angus
Fischer & Porter Co.
Foxboro Co.
Fredericks Co., George
Friez Instr. Div.
Fulton Sylphon Div.
Gas Appliance Specialties
GE, Apparatus Sales
General Physical Lab.
Genisco, Inc.
Giannini & Co.
Gilmore Industries
Gordon Co., Claud S.
Gotham Instr. Div.
Gulton Mfg. Co.
H & H Thermostats
Hastings-Raydist
Hathaway Instr. Co.
Hays Corp.
Heise Bourdon Tube Co.
Helicoid Gage Div.
Herman, Victor George
High Vacuum Equipt.
Hill & Co., E. V.
Hoke,Inc
Industrial Electronics
Industrial Instr. Co.
Jackson Co., Byron
King Engrg. Co.
Kollsman Instruments
Kontes Glass
Logansport Machine
Lonergan Co.
Magnetic Gauge Co.
Manning, Maxwell & Moore
Mansfield & Green
Marsh Corp., Jas. P.

Seegers

YOUR ANSWER FOR THE BEST GAUGE

INDUSTRIES SPECIALIST FOR GAUGE COMPONENTS



GAUGE MOVEMENTS
GAUGE BOURDON TUBES
GAUGE HAIRSPRINGS
GAUGE LINKS
GEAR CUTTERS (fine pitch)

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For more information circle **280** on inquiry card.

Marshalltown Mfg. Co.
Mason-Neilan Div.
Massa Labs.
Mercoid Corp.
Meriam Instr. Co.
Metron Instr. Co.
Micrometrical Mfg.
Miller Robinson Co.
Minneapolis-Honeywell
Moeller Instr. Co.
Moore Products
National Research
Norden-Ketay
Nurnberg Thermom. Co.
Penn Insts. Div.
Perfex Corp.
Photocon Research Prods.
Podbielniak, Inc.
Precision Scientific
Prec. Thermom. & Insts.
Preferred Utilities Mfg.
Process & Instruments
Rahm Instruments
Ramapo Engrg.
RCA Div.
Refinery Supply Co.
Republic Flow Meters
Rochester Mfg. Co.
Ruge Assocs.
Sargent & Co.
Schauer Mfg. Co.
Scientific Glass App.
Scientific Instr. Co.
Scientific Specialties
Seely Instr. Co., Inc.
Servonic Insts., Inc.
Shallcross Controls
Statham Labs.
Stewart-Warner
Stoelting Co.
Stokes Machine Co.
Superior Meter Co.
Surface Combustion
Sylvania Elect. Prods.
Taylor Instr. Cos.
Technical Equipt. Co.
Thwing-Albert
Todd Scientific
Trans-Sonics, Inc.
Trerice Co.
Trimount Instr. Co.
Uehling Instr. Co.
United Instr. Co.
U. S. Gauge Div.
Universal X-Ray Prods.
Wagner & Son, Carl H.
Wallace & Tiernan
Weksler Thermom. Corp.
Welch Mfg. Co., W. M.
Weston Electcl. Instr.
Wiancko Engrg. Co.
Wilgus Mfg. Co.
Winslow Co.
Ultradyne Engrg. Labs.

PRESSURE GAGE MOVEMENTS

Alina Corp.
Bristol Co.
Burton Mfg. Co.
Diamond Instr. Co.
General Control Co.
GE
Giannini & Co.
Grammes & Sons, Inc
Instruments Gear Works
Kollsman Instr. Corp.
Lonergan Co.
Plumb Co.
Seegers Mfg. Co.
Trerice Co.
Wilder, Inc., R. S.

PRESSURE INDICATORS, Electrical Resistance

Ace Electronics
Aeroquip Corp.
Atlantic Research
Baldwin-Lima-Hamilton
Bourns Labs.
Bristol Co.
Brush Electronics
Colvin Labs.
Control Engrg. Co.
Cook Electric
Daytronic Corp.
Dynamic Instruments
Edcliff Instruments
Edison Inc., Thomas A.
Electro-Mec Lab.
Electro Products Lab.
Electronic Engrg. Assocs.
Engineering Res. & Devel.
Foxboro Co.
GE
Genisco Inc.
Giannini & Co.
Gilmore Industries
Hamilton Watch
Hastings-Raydist
Hathaway Instr. Co.
Industrial Electronics
Jackson Co., Byron
Manning, Maxwell & Moore
Minneapolis-Honyewell
Norden-Ketay
Polyphase Instr. Co.
Rahm Instruments
Ramapo Engrg. Co.
Rubicon Co.
Ruge Assocs.
Scientific Enterprises
Servonic Instruments
Shallcross Controls
Sheffield Corp.
Simpson Electric
Skaneateles Mfg. Co.
Statham Labs.
Stewart-Warner
Swartwout Co.
Technology Instrument
Thwing-Albert
Trans-Sonic, Inc.
Trimount Instr. Co.
Ultradyne Engrg. Co.
U. S. Gauge Div.
Weston Electcl. Instr.

PRESSURE INDICATORS and/or RECORDERS, High Pressure (Above 1000 psi)

Acme Gauge & Instr. Co.
Aeroquip Corp.
American Chain & Cable
Amer. Instr. Co.
Amer. Meter Co.
Annis Co.
Ashton Valve Co.
Atlas Valve Co.
Autoclave Engrs. Inc.
Autom. Temp. Contr. Co.
Bacharach Indust. Instr.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Beckman & Whitley, Inc.
Bourns Labs.
Bristol Co.
Brooks Engrg. Co.
Builders-Providence
Cambridge Instr. Co.
Cameron Iron Works
Century Electronics
Coleman Instruments
Commercial Research
Cook Electric
Cooper Co., Clark
Crescent Engrg. & Res.
Crosby Steam Gage
Dickson Co.
Dillon & Co.
Electro Prods. Lab.
Electronics Prods. Co.
Elematic Equipt. Corp.
Emery Co., A. H.
Endevco Corp.
Esterline-Angus
Fischer & Porter Co.
Fisher Governor
Foxboro Co.
Gems Co.
Giannini & Co.
Gilmore Industries
Gotham Instr. Co.
Hagan Corp.
Hathaway Instr. Co.
Hays Corp.
Heise Bourdon Tube Co.
Helicoid Gage Div.
Indikon Co.
Industrial Electronics
Indust. Instr. Corp.
Jackson Co., Byron
Kistler Instr. Co.
Kollsman Instr. Co.
Leeds & Northrup
Linde Air Products
Manning, Maxwell & Moore
Mansfield & Green
Marsh Corp., Jas. P.
Marshalltown Mfg. Co.
Mason Neilan Div.
McAlear Mfg. Co.
Meriam Instr. Co.
Minneapolis-Honeywell
  Indust. Div.
Moore Products
Norden-Ketay
Penn. Insts. Div.
Photocon Research Prods.
Rahm Instruments
RCA Div.
Republic Flow Meters
Ruge Assocs.
Ruska Instr. Corp.
Schaevitz Engineering
Scientific Instr. Co.
Servonic Instruments
Sheffield Corp.
Statham Labs.
Streeter-Amet
Swartwout Co.
Taber Instr. Corp.
Taylor Instr. Cos.
Trerice Co.
United Electric
United Instr. Co.
U. S. Gauge Div.
Weksler Thermom. Corp.
Wiancko Engrg. Co.

PRESSURE INDICATORS, Membrane (see also Draft)

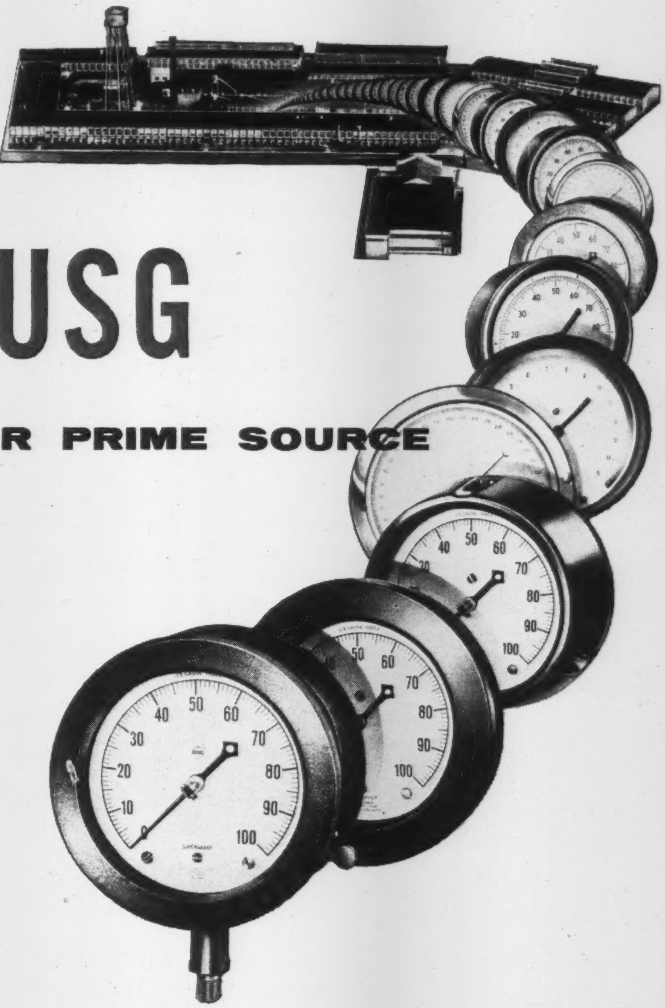
Aeromarine Instr. Co.
Burton Mfg. Co.
Century Electronics
Dwyer Mfg.
Edcliff Instruments
Ellison Draft Gage Co.
Hays Corp.
Henschel Corp.
Penn Insts. Div.
Republic Flow Meters
Ruska Instr. Corp.
Scientific Instr. Co.
Ultradyne Engrg. Co.

PRESSURE INDICATORS, Peak, including Blast Meters

Aeromarine Instr. Co.
Allegany Instr. Co.
Atlantic Res. Corp.
Beckman & Whitley
Chesapeake Instr. Corp.
Datran Engrg. Corp.
Endevco Corp.
Kistler Instr. Co.
Massa Labs.
Photocon Res. Prods.

PRESSURE INDICATORS, Piezoelectric

Amer. Instr. Co.
Atlantic Research Corp.
Brush Electronics
Centralab Div.
Chesapeake Instr. Corp.
Commercial Res. Div.
Control Devices
Crystal Research Labs.
Dyna Empire, Inc.
Endevco Corp.
Gulton Mfg. Co.
Kistler Instr. Co.



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...FOR *Every* TYPE OF GAUGE

From quality cast case gauges to standard steel case gauges, United States Gauge is your prime source for any type gauge, for any application. The industry's most complete line—more than 50,000 different standard gauges—is available for such applications as panel boards, compressors, pumps and process control. With slight modification, many of these standard gauges will meet special design requirements.

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UNITED STATES GAUGE
Division of American Machine and Metals, Inc.
Sellersville, Pa.

Home of the SUPERGAUGE

For more information circle 281 on inquiry card.

HEISE GAUGES

Precision Built

For laboratory service
The scientifically
accurate pressure
measuring instrument

- ★ Permanent positive accuracy of alignment guaranteed by integral construction.
- ★ Weldless heat treated Bourdon tube maintains precise calibration.
- ★ Patented "External Bleeder"
- ★ Massive Bronze casting coordinates all working parts of the gauge

Pressure ranges 15 to 20,000 psi.
Sizes 8½", 12" and 16"
Prices from $151.60

CATALOG ON REQUEST

THE STANDARD OF THE WORLD

HEISE BOURDON TUBE COMPANY, INC.
BROOK ROAD, NEWTOWN, CONNECTICUT, U.S.A.

For more information circle **282** on inquiry card.

Martin-Hubbard Corp.
Massa Labs.
RCA Div.
Scott, Inc., H. H.
Technical Instr. Co.

PRESSURE INDICATORS, Piston, Spring or Weight-Loaded

Amer. Instr. Co.
Bacharach Indust. Instr. Co.
Bailey Meter Co.
Cameron Iron Works
Century Electronics
Chatillon & Sons
Colebman Instr. & Mfg.
Commercial Research
Dillon & Co.
Gilmore Industries
Hagan Corp.
Ideal Lab Tool
Industrial Electronics
Manning, Maxwell & Moore
Mansfield & Green
Republic Flow Meters
Webster Instr. Inc.

PRESSURE INDICATORS, Precision, including large Dial

Acme Gauge & Instr. Co.
B-I-F Industries
Bendix-Friez
Burton Mfg. Co.
Chatillon & Sons
Consol. Electrodynamics
Fischer & Porter Co.
Glaser Enterprises
Hass Bros. Instr. Co.
Heise Bourdon Tube Co.
Helicoid Gage Div.
Kollsman Instr. Corp.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Morehouse Machine Co.
Scientific Instr. Co.
Sparling Meter Co.
Trerice Co.
U. S. Gauge Div.
Wallace & Tiernan

PRESSURE INDICATORS, Single-tube, Liquid Column, see Manometers

PRESSURE INDICATORS, U-tube, see Manometers

PRESSURE INSTRUMENT CALIBRATORS, Dead Weight

Amer. Instr. Co.
Ames Co., B. C.
Amthor Testing Instr. Co.
Ann Arbor Instr. Works
Beacon Gage
Burton Mfg. Co.
Central Scientific
Coleman Instruments
Consol. Electrodynamics
Crosby Steam Gage Co.
Custom Scientific
Darley Co., W. S.
Daytronic Corp.
Eastern Specialty
GE
Gilmore Instruments
Gordon Co., Claud S.
Grove Valve & Reg. Co.
Ideal-Aerosmith
Instrument Assocs.
Link Engrg. Co.
Manning, Maxwell & Moore
Mansfield & Green
Marshalltown Mfg. Co.
Morehouse Machine Co.
Myer Corp.
Olsen Testing Machine
Precision Scientific
Refinery Supply Co.
Ruska Instr. Corp.
Size Control Co.
Steel City Testing Machs.
Swedish Gage
Testing Machines, Inc.
Trerice Co.

PRESSURE PICKUPS, Electrical Output

Allied Products Div.
B-I-F Industries
Baldwin-Lima-Hamilton
Bendix-Pacific
Brush Electronics
Chesapeake Instr. Corp.
Colvin Labs., Inc.
Commercial Res. Div.
Consol. Electrodynamics
Control Components Co.
Crescent Engrg. & Res.
Datran Engrg. Corp.
Decker Aviation Corp.
Dynamic Instr. Co.
Electro Prods. Labs.
Electronic Engrg. Assocs.
Electronics Devel. Lab.
Endevco Corp.
Fairchild Conts. Corp.
Foxboro Co.
Genisco Inc.
Giannini & Co.
Graydon Smith Prods.
Hagan Corp.
Hart Associates
Industrial Electronics
Kistler Instr. Co.
Kollsman Instr. Corp.
M B Mfg. Co.
Med. Electronics Devel.
Midwestern Geophysical
Monarch Radio
Naybor Labs.
Optronic Co.
Pace Engrg. Co.
Phillips & Hiss
Pickering & Co.
Propulsion Devel. Lab.
RCA
Rahm Insts., Inc.
Servomechanisms Inc.
Servonic Instruments
Southw. Ind. Electronics
Sperry Products
Statham Labs.
Taber Instr. Corp.
Technical Instr. Co.
Trans-Sonics, Inc.
Ultradyne Engrg. Labs.
Wiancko Engrg. Co.

PRESSURE RECORDERS, including Manometer Type

Amer. Meter Co.
American Paulin
Autom. Temp. Contr. Co.
B-I-F Industries
Bacharach Indust. Instr.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Beckman & Whitley
Bendix Aviation Corp.
Berkeley Div.
Bourns Labs.
Bridgeport Thermostat
Bristol Co.
Builders-Providence
Burton Mfg.
Century Instr. Co.
Consol. Electrodynamics
Cook Electric
Crosby Steam Gage
Datran Engrg. Corp.
Defender Instr. & Reg.
Dickson Co.
Electric Auto-Lite
Engineering Res. & Devel.
Epic, Inc.
Esterline-Angus
Fischer& Porter Co.
Foxboro Co.
General Mills
Giannini & Co.
Gordon Co., Claud S.
Gorrell & Gorrell
Gotham Instr. Co.
Hagan Corp.
Hamilton Watch
Hays Corp.
Ideal-Aerosmith
Impact Register Co.
Improved Gauge Mfg. Co.
Industrial Instr. Corp.
Kahl Scientific Instr.
Kenyon Instr. Co.
Leeds & Northrup
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Mason-Neilan Div.
Matisa Equipt. Corp.
Minneapolis-Honeywell
  Indust. Div.
Moeller Instr. Co.
Moore Products
Penn Insts. Div.
Powers Reg. Co.
Republic Flow Meters
Sanborn Co.
Schaevitz Engineering
Scientific Instr. Co.
Sheffield Corp.
Simplex Valve & Meter Co.
Sparling Meter Co.
Stoelting Co.
Streeter-Amet
Summers Gyroscope
Swartwout Co.
Taller & Cooper
Taylor Instr. Cos.
Thrush & Co.
Topp Industries
Trerice Co.
Uehling Instr. Co.
U. S. Gauge Div.
Weksler Thermom. Corp.
Weston Electcl. Instr.

PRESSURE RECORDERS, Electrical-resistance

Ace Electronics
Aeroquip Corp.
Allegany Instr. Co.
Allied Products Div.
Atlantic Research
Baldwin-Lima-Hamilton
Bourns Labs.
Bristol Co.
Cons. Electrodynamics
Electronic Engrg. Assocs.
Foxboro Co.
Gilmore Industries
Hamilton Watch
Indikon Co.
Indust. Instr. Co.
Kybernetes Corp.
Larson Instr. Co.
Streeter-Amet
Swartwout Co.
Taber Instr. Corp.
Weston Electcl. Instr.

PRESSURE RECORDERS, Piezolectric

Allied Products Div.
Atlantic Research
Brush Electronics
Chesapeake Instr. Corp.
Control Devices, Inc.
Endevco Corp.
Massa Labs.
RCA Div.

PRESSURE RECORDERS, Piston, Spring or Weight-loaded

Autom. Temp. Contr. Co.
Bacharach Indust. Instr.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bristol Co.
Brush Electronics
Century Instr. Co.
Chatillon & Sons
Commercial Res. Div.
Cook Electric
Electric Auto-Lite
Engineering Res. & Devel.
Epic Inc.
Fischer Porter Co.
G. M. Mfg. Co.
Giannini & Co.
Gilmore Industries
Hathaway Instr. Co.
Hays Corp.
Heiland Research
Manning, Maxwell & Moore
Minneapolis-Honeywell
Moore Products
Penn Insts. Div.
Powers Reg. Co.
Republic Flow Meters
Ruge Assocs.
Scientific Instr. Co.
Sheffield Corp.
Statham Labs.
Streeter-Amet
Summers Gyroscope
Thwing-Albert
Trimount Instr. Co.
Yellow Springs Instr. Co.

PRESSURE REDUCING VALVES, see Valves, Pressure Reducing and/or Backpressure

PRESSURE REGULATORS, Air or Gas

Accessory Prods. Corp.
Aeronaut., Robertshaw-
  Fulton
AiResearch Mfg. Co.
Airmatic Valve, Inc.
Amer. Meter Co.
Askania Reg. Co.
Bastian-Blessing
Bellofram Corp.
Bellows Co.
Bendix Aviation Corp.
Black, Sivalls & Bryson
Bristol Co.
Brooke Engrg. Co.
Cash Valve Mfg. Corp.
Century Controls Corp.
Colvin Labs.
Conoflow Corp.
Cutler-Hammer
Davis Reg. Co.
Eclipse Fuel Engrg. Co.
Fischer & Porter Co.
Fisher Governor
Foster Engrg. Co.
Fulton Sylphon Div.
General Controls Co.
Grove Valve & Reg. Co.
Hagan Corp.
Hoke, Inc.
Johnson Service Co.
Jordan Corp., Div.
Kahle Engrg. Co.
Kaye & MacDonald
Keckley Co., O. C.
Kieley & Mueller
Klipfel Valves
Kollsman Instr. Corp.
Leslie Co.
Linde Air Products
Manning, Maxwell & Moore
Manostat Corp.
Mason-Neilan Div.
McAlear Mfg. Co.
McDonnell & Miller
Micromat Co.
Minneapolis-Honeywell
  Indust. Div.
National Pneumatic Co.
Natural Gas Equipt. Co.
Norgren Co.
Powers Reg. Co.
Propulsion Devel. Labs.
R. K. L. Valve & Mfg. Co.
Reliance Instr. Mfg. Corp.
Republic Flow Meters
Research Controls
Reynolds Gas Reg. Co.
Robbins Aviation
Rockwell Mfg. Co.
Schade Valve Mfg. Co.
Schrader's Son, A.
Scientific Instr. Co.
Seely Instr. Co.
Squires Co.
Stratos Div.
Taylor Instr. Cos.
Trerice Co.
United Electric Controls
Vapor Recovery Systems
Wallace & Tiernan
Watts Reg. Co.
Weighing Components
Westinghouse Air Brake

PRESSURE RELIEF, Rupture Discs

Accessory Prods. Corp.
Amer. Instr. Co.
Amer. Meter Co.
Autoclave Engrs.
Baker & Co.
Bendix-Freiz
Black, Sivalls & Bryson
Frangible Discs, Inc.
Henry Valve Co.
High Pressure Equipt. Co.
Koehler Instr. Co.
Micromat Co.
Pressure Prods. Industries

PRESSURE RELIEF VALVES, see Valves, Relief

PRESSURE SNUBBERS

Acme Gauge & Instr. Co.
Amer. Chain & Cable
Amer. Meter Co.
Ashton Valve Co.
Autoclave Engrs.
Bristol Co.
Campbell Co.

Pressure Gauges, Recording and Automatic Control

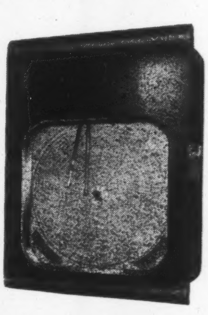
Bristol Series 500 Gauges come in a very wide variety of models for recording and controlling pressure, draft, vacuum, absolute pressure, liquid level in ranges from 0 to 6 mm of mercury absolute, full vacuum, and from 0 to 5 in. water to 10,000 psi.

These easy-to-use, easy-to-service instruments are highly accurate and extremely stable in all ranges of application.

Write for Bulletins G620 and G621.

BRISTOL COMPANY
112 Bristol Rd., Waterbury 20, Conn.

For more information circle **283** on inquiry card.



MARSHALLTOWN

DIAPHRAGM GAUGE

For Accurate Pressure Measurement in Ounces or Inches of Water

3
6
9
12
15
OUNCES

Marshalltown Figure 83 is an extremely sensitive gauge that uses a carefully seasoned bronze diaphragm to accurately measure very low pressures. It is used extensively on many types of natural gas installations for checking low pressures.

Write for details and price. LOOK TO MARSHALLTOWN FOR ONE OF THE MOST COMPLETE LINES OF INDICATING PRESSURE GAUGES MADE!

Available in standard dials (reading in inches of water) 0-15" -0-30" -0-60" -0-100" -0-160" . . . also in ounce graduated dials from 15 ounces to 5 pounds. 2½", 3½" and 4½" dial sizes mounted in black enameled steel case.

MARSHALLTOWN MANUFACTURING CO.

MARSHALLTOWN 3, IOWA

For more information circle **284** on inquiry card.

FOR MAXIMUM SENSITIVITY. .

CONOFLOW small volume AIR PRESSURE REGULATORS

The Conoflow Model H-10 Precision Regulator is an inexpensive, reducing-relief type regulator ideal for small volume or "dead-end" service. It is capable of maintaining set pressures to within .005 psi regardless of vibration or upstream pressure variations. Dependability of the Cono Regulator is attested to by its use as original equipment by many nationally known manufacturers. Streamlined design of all brass and stainless steel construction. Available for flush panel or line mounting in ¼" pipe size. Spring ranges from 0-5 to 0-125 psi.

Write for Bulletin H-2

CC-504

Cono Controls®

CONOFLOW CORPORATION

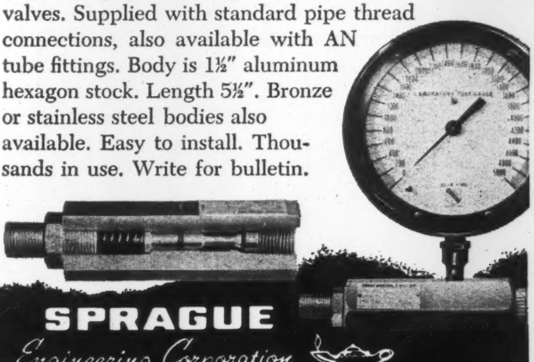
FOREMOST MANUFACTURERS OF FINAL CONTROL ELEMENTS

2100 ARCH STREET, PHILADELPHIA 3, PA.

For more information circle **286** on inquiry card.

PROTECT EXPENSIVE GAGES

SPRAGUE SHUT OFF VALVES automatically cut out gages and other pressure-sensitive instruments when fluid pressures go beyond their operating limits. Automatically open when pressure is again within approx. 80% of set cut-out points. Available for any pressure setting between 10 PSI. and 5000 PSI. Save valuable man hours. Eliminate opening and closing manually operated shut off valves. Supplied with standard pipe thread connections, also available with AN tube fittings. Body is 1½" aluminum hexagon stock. Length 5½". Bronze or stainless steel bodies also available. Easy to install. Thousands in use. Write for bulletin.



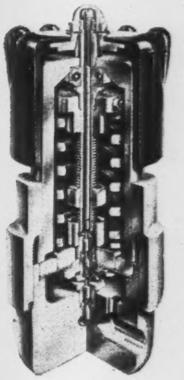
SPRAGUE

Engineering Corporation

1144 WEST 135TH STREET, GARDENA, CALIFORNIA

For more information circle **285** on inquiry card.

GROVE SMALL VOLUME HIGH PRESSURE REGULATORS



For accurate control of air, gas, liquid

Designed for reducing, back pressure and direct operating relief, or various combinations of these services. Carry pressure ratings up to 3,500 psi and control ranges of 5 to 2,000 psi on reducing and back pressure services, and up to 10,000 psi on relief service. Write for our free booklet.

GROVE VALVE AND REGULATOR COMPANY

65th & Hollis Streets, Oakland 8, California

For more information circle **287** on inquiry card.

gagegard gagega
gard gagegard ga

PROTECT PRESSURE-SENSITIVE INSTRUMENTS . . . POSITIVELY

GG gage gard

Seals off gage or manometer connection at any pre-set pressure. Will repeat within 1% of scale. Will release 2% below cut-off point.

Models available with cutoffs from 20" water to 9000 psig. liquids and gases. Designed to withstand and hold closed against 10,000 psig.

Marine models available.

Write for Bulletin 541-G for full details and prices.

INDUSTRIAL ENGINEERING CORPORATION

525 E. Woodbine, Louisville, Ky.

For more information circle **288** on inquiry card.

New·Swiss Made

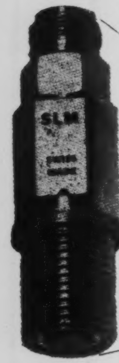
HIGH Frequency Response

QUARTZ PRESSURE TRANSDUCER

Oscillographic Indication of Instantaneous Pressure Transients in: Shock Tubes • Engines • Rockets • Hydraulic Systems

FEATURES:

- Static Calibration
- High Sensitivity
- Temperature Stability
- High Accuracy
- Rugged Construction
- One transducer for all pressures



ACTUAL SIZE

SPECIFICATIONS:

PRESSURE RANGE	0—2500 PSI
WITH ADAPTER	2000 PSI
ACCURACY	1%
FREQUENCY RANGE	0—40000 CPS
RESOLUTION	.01%
MAXIMUM GAGE TEMPERATURE	600° F
MAXIMUM GAS TEMPERATURE	3000° F
MOUNTING THREAD	14 MM

for literature write to:

KISTLER INSTRUMENT COMPANY

15 WEBSTER STREET, NORTH TONAWANDA, N. Y.

For more information circle **289** on inquiry card.

Chemquip Co.
Crosby Steam Gage
Dahl & Co.
Douglass Automatic
Fischer & Porter Co.
Fluor Corp.
Gar Prec. Parts, Inc.
Helicoid Gage Div.
Hoke, Inc.
King Engrg. Corp.
Logeman Co.
Lonergan Co.
Manning, Maxwell & Moore
Mansfield & Green
Marsh Corp., Jas. P.
Martin Decker Corp.
McAlear Mfg. Co.
Meriam Instr. Co.
Metal Goods Corp.
Micro Metallic Corp.
Minneapolis-Honeywell
National Engrg. Prods.
Parker Appliance
Parsons Co.
Republic Mfg. Co.
Smith Co., S. Morgan
Sprague Engrg. Corp.
Weksler Thermom. Corp.

PRESSURE STANDARDS, see Standards, Pressure

PRESSURE SWITCHES, see Switches, Pressure

PRESSURE TESTING DEVICES, High Pressure (Above 1000 psig.)

Accessory Prods. Corp.
Acme Gauge & Instr. Co.
Allied Products Div.
Amer. Instr. Co.
Ashton Valve Co.
Autoclave Engrs.
Bacharach Indust. Instr.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bourns Labs.
Bristol Co.
Builders-Providence
Carver, Fred S.
Chatillon & Sons
Colvin Labs.
Cook Electric
Crosby Steam Gage
Dickson Co.
Dillon & Co.
Electro Prods. Labs.
Foxboro Co.
Gems Co.
Hathaway Instr. Co.
Hawk Tool & Engrg. Co.
High Pressure Equipt. Co.
Industrial Electronics
Industrial Engrg. Co.
Internat. Radiant Corp.
Jackson Co., Byron
Kahn & Co.
Manning, Maxwell & Moore
Mansfield & Green
Marsh Corp., Jas. P.
Martin-Hubbard Corp.
Minneapolis-Honeywell
Parr Instr. Co.
Penn Insts. Div.
Pioneer Instr. Co.
Press. Prods. Industries
RCA Div.
Refinery Supply Co.
Roy Co., Milton
Ruge Assocs.
Ruska Instr. Corp.
Scientific Instr. Co.
Sheffield Corp.
Sprague Engrg. Corp.
Statham Labs.
Steel City Testing Machs.
Streeter-Amet
Taylor Instr. Cos.
Trerice Co.
United Electric
U. S. Gauge Div.
Weksler Thermom. Corp.
Wiancko Engrg. Co.

PRESSURE TRANSMITTERS, Electrical Output

Amer. Meter Co.
Automation Prods., Inc.
B-I-F Industries
Bendix Aviation Corp.
Bristol Co.
Brooke Engrg. Co.
Century Electronics
Chesapeake Instr. Corp.
Colvin Labs.
Control Components Co.
Datran Engrg. Corp.
Dayton Instr. Inc.
Decker Aviaton Corp.
Edison, Inc., Thomas A.
Fairchild Conts. Corp.
Fischer & Porter Co.
Foxboro Co.
Genisco Inc.
Giannini & Co.
Hagan Corp.
Hays Corp.
Healy-Ruff
Henschel Corp.
Industrial Electronics
Kistler Instr. Co.
Kollsman Instr. Corp.
Manning, Maxwell & Moore
Medical Electronic Devel.
Pace Engrg. Co.
Scientific Instr. Co.
Servonic Instruments
Shand & Jurs
Simplex Valve & Meter
Sparling Meter
Sparton Cont. Systems
Statham Labs.
Swartwout Co.
Taber Instr. Corp.
Ultradyne Engrg. Labs.

PRESSURE TRANSMITTERS, Pneumatic Output

Airflow Instr. Co.
Amer. Meter Co.
Assoc. Valve & Engrg.
B-I-F Industries
Black, Sivalls & Bryson
Bristol Co.
Conoflow Corp.
Fischer & Porter Co.
Foxboro Co.
Hagan Corp.
Indust. Instr. Corp.
King Engrg. Corp.
Leslie Co.
Manning, Maxwell & Moore
Mason-Neilan Div.
Minneapolis-Honeywell
  Indust. Div.
Moore Products
Penn Insts. Div.
Republic Flow Meters
Scientific Instr. Co.
Simplex Valve & Meter
Taylor Instr. Cos.
U. S. Gauge Div.
Westinghouse Air Brake

PRIMARY ELEMENTS, see Object of Measurement, e.g. Flow, Displacement, etc.

PRINTED CIRCUITS, see Circuits, Graphic

PRINTERS, Numerical Data, including Data Loggers, High Speed Printers, Typewriters, etc. (see also Data Processing)

Acromark Co.
Aero Electronics
ANelex Corp.
Austin Co.
Bendix-Pacific
Berkeley Div.
Carrol Co.
Clary Corp.
Commercial Controls Corp.
Detectron
Electro Instruments
Electronic Contr. Systems
Ersco, Inc.
Fischer & Porter Co.
Franklin Electronics
Friden Calc. Mach. Co.
Giannini, Datex Div.
Hanson-Gorrill-Brian
Hewlett-Packard
Hycon Electronics
Indust. Electronic Engrs.
Internat. Business Machs.
Kleinschmidt, Inc.
Lab. for Electronics
Landis & Gyr
Metrotype Corp.
Monroe Calc. Mach. Co.
Moseley Co.
North Amer. Phillips
Olympic Development
Optronic Co.
Panellit, Inc.
Potter Instr. Co.
Probescope Co.
Radiation Instr. Dev. Lab.
Raycon Corp.
Royson Engrg. Co.
Special Insts. Lab.
Streeter-Amet
Taller & Cooper
Telecomputing Corp.
Ultrasonic Corp.
Westronics, Inc.

PRISMS. Optical, see Optical Parts

PROBES, High Voltage

Aerolite Electronics
Chicago Indust. Instr.
Coaxial Connector Co.
Cornell-Dubilier
DuMont Labs., Allen B.
Industrial Insts., Inc.
Instrument Tool & Engrg.
Jennings Radio Mfg. Corp.
Lab-Tronics
Phaostron Co.
Philco Corp.
Precise Measmts. Co.
Precision Apparatus Co.
Radio City Prods. Co.
Simpson Electric

PROBES, High Frequency

Aerolite Electronics
Chicago Indust. Instr. Co.
Coaxial Connector Co.
Cornell-Dubilier
DeMornay-Bonardi
DuMont Labs., Allen B.
Hycon Electronics
Instruments Inc.
Jennings Radio Mfg. Co.
Kay Electric
Lab-Tronics
Phaostron Co.
Precision Apparatus Co.
Radio City Prods. Co.
Sierra Electronic Corp.
Simpson Electric
Sweets Co., Martin
WacLine, Inc.
Waterman Products

PROCESS CONTROLLERS, see Control Systems, Process

PROCESS TIMING INSTRUMENTS, see Timers, Automatic Process (see also Program Controllers)

PROFILE RECORDERS, Roughness, Waviness, etc., see Dimensional Gages

PROGRAM CLOCKS, see Timers, Automatic Process

PROGRAM CONTROLLERS

A'G'A Div.
Abrams Instr. Co.
Aircraft-Marine Prods.
Alabama Automation
Allen-Bradley
Amer. Electronic Mfs.
Amer. Timer Corp.
Amglo Corp.
Autom. Control Co.
Autom. Elect. Mfg. Co.
Autom. Temp. Contr. Co.
B-I-F Industries
Bailey Meter Co.
Barber-Colman
Bendix-Friez
Black, Sivalls & Bryson
Bristol Co.
Cal-Tronics Corp.
Cincinnati Time Rec. Co.
Clare & Co.
Controls, Inc.
Counter & Control Corp.
Cramer Controls Corp.
Cutler-Hammer
Dahl & Co., G. W.
Daystrom Instruments
De-Tec-Tronic Corp.
Dietz Co., G. W.
Eagle Signal Corp.
Edison Elect. Prods.
Electric Hotpack Co.
Taylor & Co., W. A.
Electronic Controls
Electro-Physics Co.
Elgin Natl. Watch
Emmett Machine
Ferrara, Inc.
Fielden Instr. Div.
Electric Switch Corp.
Fisher Governor
Foxboro Co.
Fischer & Porter Co.
Fuel Watchman
G V Controls Inc.
Fredericks Co., Geo.
General Controls Co.
GE, Apparatus Sales
Gotham Instr. Div.
Guardian Electric Mfg.
Hagan Corp.
Haledy Electronic Co.
Hallikainen Insts.
Haydon Mfg. Co.
Healy-Ruff
Hillyer Instr. Co.
Industrial Control Panel
Industrial Timer
Haydon Co., A. W.
Internat. Business Machs.
International Register
Johnson Service Co.
Leeds & Northrup
Lumenite Electronic
Mason-Neilan Div.
Miller-Harris Instr. Co.
Minneapolis-Honeywell
  Indust. Div.
Montgomery Mfg.
National Time & Signal
Newmatic Corp.
North Electric
Northwestern Clock
Paragon Electric
Partlow Corp.
Perfex Controls Div.
Photographic Products, Inc.
Photovolt Corp.
Potter Instr. Co.
Powers Reg. Co.
Pratt & Whitney
Production Instr. Co.
Rhodes, Inc.
Sangamo Electric
Seely Instr. Co.
Seth Thomas Clock
Shand & Jurs
Sinclair Collins Valve
Soreng Products
Std. Elect. Time Co.
Stoelting Co.
Stromberg Time Corp.
Struthers-Dunn
Taylor Instr. Cos.
Telechron, Inc.
Thordarson Elect. Mfg.
Tork Clock
Vocaline Corp.
Walkirt Co.
Wallace & Tiernan
Walser Auto. Timer
Ward Leonard
West Instr. Corp.
Weston Electcl. Instr.
Wheelco Instr. Div.
White-Rodgers
Wilson & Co., G. C.
Yellow Springs Instr.
Zenith Electric

PROJECTORS, Film Slides, Lantern Slide and Opaque Object

Aloe Co., A. S.
Amer. Measuring Insts.
Amer. Optical
Bausch & Lomb
Bell & Howell
Beseler Co.
Bolsey Corp.
Buhl Optical
Burke & James
Burton Mfg. Co.
Davisdson Mfg. Co.
E & S Optical
Eastman Kodak Co.
Eberbach & Son

Edmund Scientific
Epic Inc.
Ercona Corp.
Fish-Schurman
G-M Labs.
Gen. Biological Supp.
Gordon Enterprises
Gurley, W. & L. E.
International Devel. Co.
Jarrell-Ash
Lafayette Instr. Co.
Leitz, Inc.
Pflatz & Bauer
RCA Div.
Stocker & Yale
Tarc Electronics
Testa Mfg. Co.
Vectron, Inc.
Williams, Brown & Earle
Zeiss, Inc., Carl

PROJECTORS, Industrial Inspection

Amer. Optical
Bausch & Lomb
Beseler Co.
Buhl Optical
Corbett Science Labs.
DoAll Co.
Eastman Kodak Co.
Eberbach Corp.
Edmund Scientific
Engineers' Specialties Div.
Engis Equipt. Co.
Ercona Corp.
Hirschmann Co.
International Devel. Co.
Lab Optical Co.
Lafayette Instr. Co.
Leitz Inc.
Mason Instr. Co.
Pan-Technics, Ltd.
Portman Instr. Co.
Scherr Optical Tools
Sheffield Corp.
Stocker & Yale
Testa Mfg. Co.
Unertl Optical
Whittington Pump & Engrg.
Wilder, Inc.
Zoomar Corp.

PROJECTORS, Micro

Amer. Measuring Insts.
Applied Research Labs.
Bausch & Lomb
Buhl Optical
Brinkmann Instruments
Central Scientific
Ercona Corp.
F[illegible]ner Co.
Fish-Schurman
Genl. Biological Supp.
Graf-Apsco
Internat. Devel. Co.
Internat. Mircoscope
Jarrell-Ash
Jones & Lamson
Leitz, Inc.
Mine Safety Appliances
National Instr. Co.
Opplem Co.
Pfaltz & Bauer
Portman Instr. Co.
Scherr Optical Tools
Stocker & Yale
Testa Mfg. Co.
United Scientific
Victor Animatograph Corp.
Whittington Pump & Engrg.
Wilder, Inc.
Ziess, Inc., Carl

PROJECTORS, Optical, including Color Film

ACF Electronics
Amer. Optical
Askania-Werke A. G.
Avion Div.
Bausch & Lomb
Bell & Howell
Beseler Co.
Bolsey Corp.
Bray Optical
Buhl Optical
Burke & James
Eastman Kodak Co.
Engis Equipt. Co.
Ercona Corp.
G-M Labs.
Genl. Biological Supp.
Genl. Prec. Lab.
Gordon Enterprises
Graf-Apsco
Helio Instr. Co.
Jarrell-Ash
Leitz, Inc.
Lovins Engrg. Co.
Opplem Co.
Pan-Technics, Ltd.
RCA Div.
Schneider-Cogswell
Tarc Electronics
Testa Mfg. Co.
Unertl Optical
Victor Animatograph Corp.
Williams, Brown & Earle
Williamson Devel. Co.
Wollensak Optical
Zenith Optical Lab.
Zoomar Corp.

PROJECTORS, Oscillogram

Consol. Electrodynamics
Corbett Science Labs.
Gordon Enterprises
International Devel. Co.
Radioactive Products Co.
Telecomputing Corp.

PROJECTORS, Rectifying

Abrams Instr. Co.
Bausch & Lomb
Gordon Enterprises

PRONY BRAKES, Hydraulic

Post Co., Frederick
GE, Apparatus Sales
Taylor Dynamometer

PROPELLER TEST STANDS

Acme Gauge
Airplane Mfg. & Supply
Baldwin-Lima-Hamilton
Berkeley Div.
Brown & Sharpe
Falstrom Co.
Gadgets Inc.
Gimore Industries
Industrial Engrg. Corp.
Kahn & Con.

PROPORTIONING PUMPS, see Pumps, Metering and Proportioning

PROSPECTING INSTRUMENTS, see Geophysical

PROTRACTORS, Bevel, see Drawing Instruments

PROTRACTORS, Course, see Navigational Instruments

PROTRACTORS, Navigator's, see Navigational Instruments

PROTRACTORS, Transparent, see Drawing Instruments

PROVERS, Gas Meter, see Flow Provers

PROVING RINGS, see Testing Machine Calibrators

PSYCHOLOGY LABORATORY APPARATUS (see also Polygraphs)

Amer. Electronic Labs.
Associated Research
Baird Assocs.-Atomic Instr.
Brush Electronics
Electro-Medical Lab.
Electro-Physics Co.
Electrosig Corp.
General Radio Co.
Gorrell & Gorrell
Industrial Control Co.
Lab-Tronics
Lafayette Intsr. Co.
Macbeth Corp.
Martin-Hubbard
Phipps & Bird
Scott, Hermon H.
Stoelting Co.
U. S. Testing Co.
Yellow Springs Instr. Co.

PSYCHROMETERS, see Humidity Instruments, Psychrometric

PUBLIC HEALTH TESTING EQUIPMENT

Aloe Co., A. S.
Amer. Optical Co.
Amer. Scientific
Anton Electronic Labs.
Applied Research Labs.
B-I-F Industries
Burton Mfg. Co.
Central Scientific
Chicago Apparatus Co.
Corning Glass Works
Electric Hotpack Co.
Electric Scient. Co.
Genl. Biological Supp.
Hellige, Inc.
Industrial Control Co.
Instrument Dev. Labs.
Kontes Glass
LaMotte Chem. Prods.
Lennard Co.
Lumenite Electronic
Menlo Research Lab.
Mine Safety Appliance
Owens Illinois
Phipps & Bird
Photovolt Corp.
Precision Scientific
Radiation Instr. Dev. Lab.
Rieker Instr. Co.
Rubicon Co.
Scientific Glass App.
Scott, Hermon H.
Taylor & Co., W. A.
Ultra-Violet Prods.

PULP TESTERS, see Paper and Pulp Testing

PULSATION DAMPERS, see Pressure Snubbers

PULSE GENERATORS, see Generators, Pulse

PULSE TRANSFORMERS, see Transformers, Pulse

PULVERIZED MATERIALS MEASUREMENTS, see Particle Instruments

PUMICE

Dixon, Inc.
King-Malcolm
Rhodes & Co.
Wagner Co., Inc., C. A.
Whittaker, Clark & Daniels

PUMP GOVERNORS, including Regulators

Acme Reg. Co.
Air Associates
AiResearch Mfg. Co.
Allen-Bradley
Area Regulators, Inc.
Askania Reg. Co.
Assoc. Valve & Engrg.
Atlas Valve Co.
Autom. Control Co.
Autom. Temp. Contr. Co.
B. W. Controller Corp.
Bailey Meter Co.
Bastian-Blessing
Beck Co.
Bendix-Friez
Black, Sivalls & Bryson
Block Mfg. Co.
Boekel & Co.
Boylston Co.
Bristol Co.
Brooke Engrg. Co.
Builders-Providence
Cash Co., A. W.
Cash Valve Mfg. Corp.
Climax Div.
Conoflow Corp.
Continental Foundry
Controls Corp. of Amer.
Cooper Co., Clark
Cutler-Hammer
Davis Reg. Co.
Detroit Lubricator
Eclipse Fuel Engrg. Co.
Engelhard, Inc., Charles
Farris Engrg. Co.
Fischer & Porter Co.
Fisher Governor
Ford Reg. Valve Co.
Foster Engrg. Co.
Foxboro Co.
Fulton Sylphon Div.
Furnas Electric
Gas Appliance Spec.
General Controls
GE
General Regulator
Grove Valve & Reg.
H-B Instr. Co.
Hagan Corp.
Hammel-Dahl
Hays Corp.
Henszey Co.
Hoke, Inc.
Ideal Lab. Tool Corp.
Industrial Instr.
Jack Scientific Co., Bill
Johnson Service Co.
Jordan Reg. Co.
Keckly Co., O. C.
Kaye & MacDonald
Kendall Controls Corp.
Kieley & Mueller
Klipfel Valves

Eliminate
PROCESS LEAD LINES
in Pressure Measurement

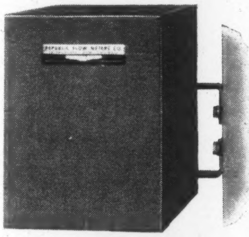
. . . by using the CONO PNEUMATIC PRESSURE TRANSMITTER. Bolts directly to the tank. Operates through diaphragm or bellows using force-balance principle. Ideal for service involving viscous substances or materials that solidify in conventional measuring elements. For pressure transmission, liquid level in open tanks, bulk material storage bins, etc. Write today for BULLETIN P-25 20.

CONOFLOW CORPORATION
2100 ARCH ST.
PHILADELPHIA 3, PA.

Cono-Controls

CC-113R

For more information circle **291** on inquiry card.



REPUBLIC
PNEUMATIC TRANSMITTERS

Republic pneumatic transmitters are devices for converting process variables, such as flow, liquid level, pressure or liquid density, into air pressures which vary proportionally with the process variables.

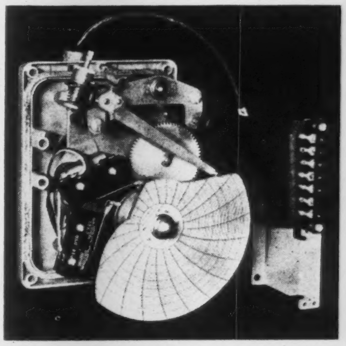
These air pressures can be used as the measuring impulse for the actuation of an automatic controller or a direct reading recorder.

WRITE FOR DATA BOOK No. 56-13

REPUBLIC FLOW METERS CO.
2240 Diversey Pkwy. Chicago 47, Ill.

REPUBLIC
INSTRUMENTS • CONTROLS

or more information circle **290** on inquiry card.



BAILEY
PROGRAM CONTROLLER

- Positions a pneumatic transmitter in accordance with time/amplitude function of a 6-inch diameter cam. This establishes a pneumatic signal which is used as a set point signal to adjust an external control relay.

The "plug-in" Program Controller and its pneumatic transmitter may be installed in the same case with one or two electronic or pneumatic receivers.

The Bailey Program Controller also drives a recording pen to record the cam program for comparison on the same chart with the controlled variable.

Request Product Specification E12-5.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For more information circle **292** on inquiry card.

INDICATING PYROMETERS AND API PANEL METERS

Model 461
0-2500°F. **$31.20**

Medium resistance pyrometers (4 ohms per millivolt). Automatic, bimetal cold junction correction. Compensated for copper error. Accuracy 2%. Available with 1% accuracy or thermistor compensated for wide ambient variations.

Furnished with adjusting resistor to take thermocouples up to external resistance of 10 ohms. Higher external resistance for some ranges. White or black face dials.

Standard ranges are:

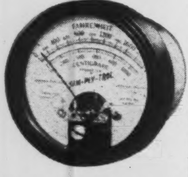
0-3000°F.
0-2500
0-2000
0-1500
0-1000
0-750
0-500
0-300
–75 to +225
–200 to +100

The minimum range for a pyrometer is 300°F. for full scale deflection from one thermocouple. Two or more thermocouples can be used in series to cut down this minimum—if their resistance does not become excessive. (Many other ranges available.)

Model 255, 2½"

Ruggedized-Sealed Pyrometer with shock-mounted movement.

0-2000°F. **$28.40**

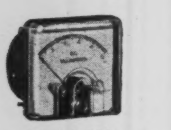


Model B Portable Pyrometers

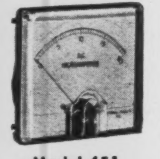
Price: **$30.50 to $55.25**

Includes thermocouple with 5′ lead and oak carrying case. Permits spot checks without requiring a permanent installation.

API PANEL METERS



Model 261
O-1Ma DC **$11.50**



Model 451
0-20 Ua DC **$27.50**

D'Arsonval movements, Alnico magnets, tubing or knife-edge pointers. AC meters are rectifier type. Normal DC accuracy, 2%, AC 3%. Higher accuracies available. Zero right, zero center meters or up to two-thirds of range suppressed available. AC and DC meters in multiple ranges. Special dials in colors, black face, your name, etc.

STYLES: PYROMETERS & API PANEL METERS

Ruggedized-Sealed
2½, 3½, 4½ inch round metal case, sealed zero adjust, shock-mounted movement.

Black Bakelite
2½", round or square, 3½" round or square, 4½" rectangular. (Other colors in 4½" size only).

Clear Plastic
2½", 3¾" and 4½" rectangular.

Note: Special panel meters and pyrometers (including ruggedized-sealed) can be engineered to your requirements.

Write for 40 page Catalog 4B.
Assembly Products, Inc., Chesterland 30, Ohio. Phone: (Cleveland, O.) HAmilton 3-4436 (West Coast: Desert Hot Springs 30, Calif. Phone: 4-3133 & 4-2453).

For more information circle **293** on inquiry card.

BRIGHTNESS and COLOR TEMPERATURE

Measured with ONE instrument . . .

SPECTRA

DIRECT-READING BRIGHTNESS SPOT METER

For detailed information on different
models and accessories please write . . .

PHOTO RESEARCH CORP.
KARL FREUND, President
837 No. Cahuenga Blvd. HOLLYWOOD 38, CALIF.

For more information circle **294** on inquiry card.

Kollsman Instr. Co.
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Lapp Insulator
Leslie Co.
Linde Air Products
Lumenite Electronic
Magnetic Instr. Co.
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Mason-Neilan Div.
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Mercoid Corp.
Mercon Reg. Co.
Minneapolis-Honeywell
Moore Products
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Norgen Co., C. A.
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Northern Equipt. Co.
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Reynolds Gas Reg. Co.
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Spence Engrg. Co.
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Swartout Co.
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Trerice Co.
Union Switch & Signal
United Electric
Warrick, Chas. F.
Water Level Controls
Weston Electcl. Instr.
White-Rodgers
Yellow Springs Instr. Co.

PUMPS, Compressed Air, see Air Compressors

PUMPS, Glass Cylinder and Piston Type

Bel Art Products
Everett Products
Fish-Schurman
Fredericks, George E.
Glasscraft Co.
Kontes Glass
Lapp Insulator Co.
Lear, Inc.
Phila. Pump & Machy.
Phoenix Prec. Instr.
Prec Glass Prod. Co.

PUMPS, High Vacuum, see Vacuum Apparatus

PUMPS, Hydraulic Control

Adel Prec. Prods.
Amer. Instr. Co.
Askania Reg. Co.
Autoclave Engrs.
Barnes Co. W. F. & J.
Bendix, Eclipse-Pioneer
Bendix-Pacific
Brown & Sharpe
Denison Engrg. Co.
Dusenbury Co.
ECO Engrg. Co.
Eastern Industs., Inc.
Ingersoll-Rand
Lapp Insulator Co.
Lear, Inc.
Ledeen Mfg. Co.
Logeman, C. W.
Pesco Products
Phila. Pump & Machy.
Precision Scientific
Pressure Prods. Industries
Rockwell Mfg. Co.
Roy Co., Milton
Shallcross Controls
Sundstrand Machine Tool
Vickers, Inc.
Worthington Corp.

PUMPS, Laboratory, High Pressure (25000 psig.)

Amer. Instr. Co.
Autoclave Engrs.
Central Scientific Co.
Cooper Co., Clark
High Pressure Equipt. Co.
Hills-McCanna
Lap Insulator Co.
Ledeen Mfg. Co.
Logeman Co., C. W.
Phila. Pump & Machy.
Pressure Prods. Industries
Proportioneers Inc.
Roy Co., Milton
Ruska Instr. Corp.
Sprague Engrg. Corp.
Specialties Inc.
Welch Mfg. Co., W. M.

PUMPS, Metering and Proportioning (see also Flowmeters, Positive Displacement)

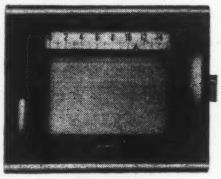
Amer. Instr. Co.
Amer. Meter Co.
Autoclave Engrs.
B-I-F Industries
Baltimore Biological Lab.
Bowser, Inc.
Central Scientific
Cooper Co., Clark
Eco Engrg. Co.
Exline Engrg. Co.
Gelber Co.,
Hills-McCanna
Ingersoll-Rand
Lapp Insulator Co.
Logeman Co.
Mechanical Products Corp.
Modern Metalcraft

Pyrometers, Automatic Controllers, Indicators, Recorders

The Bristol line of Pyrometers includes electronic potentiometer, millivoltmeter, thermocouple, and radiation types in indicating, single-pen, two-pen, and multiple record (up to 24) models.

Strip-and round-chart recorders—Automatic Controllers are available with any of the following types of control: electric, electronic, or air-operated with all types of control actions and as program controllers.

Write for Bulletins P1260,
P1245, P1242, P1244,
PB1237, and P1238.



Bristol Dynamaster ®
Electronic Potentiometer

BRISTOL COMPANY
112 Bristol Rd., Waterbury 20, Conn.

For more information circle **295** on inquiry card.

When using this Guide, look under the variable, e.g., Pressure Gages (not Gages, Pressure); or look under the noun—Magnets, Permanent (not Permanent Magnets).

National Instr. Co.
Neptune Pump
Phila. Pump & Machy.
Phipps & Bird
Pressure Prods. Industries
Process & Instruments
Proportioneers Inc.
Research Appliance Co.
Roots-Connersville
Roy Co., Milton
Ruska Instr. Corp.
Shallcross Controls
Smith Prec. Prods.
Vanton Pump & Equipt.
Wallace & Tiernan
Whitey Tool & Die

PUMPS, Vacuum, see Vacuum Apparatus

PYCNOMETERS

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Coleman Instr. & Mfg.
Fisher Scientific
G. M. Mfg Co.
Gardner Lab.
Greiner Glassblower Lab.
Humboldt Mfg. Co.
Kontes Glass
Leeds & Northrup
Martin & Co.
Owens Illinois Glass
Pyrometer Instr. Co.
Reinhart Co.
Rascher & Betzold
Scientific Glass App.
Soiltest, Inc.
Specialty Glass Co.

PYRHELIOMETERS

Bristol Co.
Cambridge Instr. Co.
Eppley Lab.
G. M. Mfg. Co.
Instruments Corp.
Kahl Scient. Instr.
Leeds & Northrup
Pyrometer Instr. Co.

PYROMETER CALIBRATING SETS

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Bristol Co.
Cambridge Instr. Co.
Dejur-Amsco
Foxboro Co.
Gray Instr. Co.
Illinois Tesing Labs
Leeds & Norhrup
Lewis Engrg. Co.
Minneapolis-Honeywell
Pyrometer Instr. Co.
Rubicon Co.
Servo Corp.
Technique Assocs.
Thwing-Albert
West Instr. Corp.
Weston Electcl. Instr.
Winslow Co.

PYROMETER LEAD WIRE, see Thermocouple Wire and Components

PYROMETER SUPPLIES, see Thermocouple Wire and Components

PYROMETER TUBES, see Thermowells

PYROMETERS, Electrical Resistance

Assembly Products
Bailey Meter Co.
Barber-Colman
Bristol Co.
Cambridge Instr. Co.
Chicago Indust. Instr. Co.
Cleveland Fuel
Dickson Co.
Electric Hotpack Co.
Engelhard Co., Inc., Chas.
Ferner Co.
Fielden Instr. Div.
Foxboro Co.
GE, Apparatus Sales
Gilmore Industries
Gordon Co., Claud S.
Gray Instr. Co.
Hagan Corp.
Huppert Co.
Illinois Testing Labs.
J-B-T Instr., Inc.
Land-Air, Inc.
Leeds & Northrup
Lewis Engrg. Co.
Minneapolis-Honeywell
  Indust. Div.
Phen-Trols, Inc.
Phoenix Prec. Instr.
Physics Research
Pyrometer Instr. Co.
Roller-Smith
Rubicon Co.
Scientific Glass App.
Servo Corp.
Shallcross Mfg.
Simpson Electric
Tell-Tronics Prods.
Thermo-Electric Co.
Thwing-Albert
Welch Mfg. Co., W. M.
West Instr. Corp.
Wheelco Instr. Div.
Winslow Co.

PYROMETERS, Expansion

Assembly Products
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Bristol Co.
Burling Instr. Co.
Epic Inc.
Ferner Co.
Hagan Corp.
Huppert Co.
Lewis Engrg. Co.
Partlow Corp.
Pyrometer Instr. Co.
Scientific Instr. Co.
Thwing Albert
Weston Electcl. Instr.
Wheelco Instr. Div
Wilson Elec. Inst.

PYROMETERS, Millivoltmetric

Assembly Products
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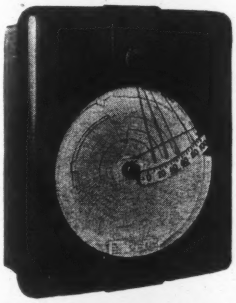
Beede Electcl. Instr. Co.
Blue M Electric
Bristol Co.
Cambridge Instr. Co.
Cleveland Fuel
Cybertronic Corp.
De Jur-Amsco
Electric Hotpack Co.
Elematic Equipt. Corp.
Engelhard, Chas. Co., Inc.
Fielden Instr. Div.
Foxboro Co.
GE, Instrument Dept.
Gilmore Industries, Inc.
Gordon Co., Claud S.
Gray Instr. Co.
Hagan Corp.
Herman, Victor George
Howell Instr. Co.
Huppert Co.
Illinois Testing Labs.
Instrument Lab., Inc.
J-B-T Instruments
Lewis Engrg. Co.
Manning, Maxwell & Moore
Marion Electcl. Instr.
Meters, Inc.
Minneapolis-Honeywell
  Indust. Div.
Pacific Transducer Corp.
Pimex, Inc.
Prec. Thermom. & Insts.
Pyramid Instr. Co.
Pyrometer Instr. Co.
Richards Co., Arklay S.
Roller-Smith
Rubicon Co.
Sensitive Res. Instr.
Simpson Electric
Tamms Silica Co.
Thermo-Electric Co.
Thermo-Electric Mfg. Co.
Thwing-Albert
Welch Mfg. Co., W. M.
West Instr. Corp.
Wheelco Instr. Div.
Winslow Co.

PYROMETERS, Optical

Bacharach Indust. Instr.
Bronoptics Co.
Burrell Corp.
Cambridge Instr. Co.
Dietert Co.
Electro-Tech Equipt.
Epic, Inc.
Fielden Instr. Div.
Fisher Scientific
Gordon Co., Claud S.
Helio Instr. Co.
Herman, Victor George
Instrument Dev. Labs
Leeds & Northrup
Lewis Engrg. Co.
Mason Instr. Co.
Minneapolis-Honeywell
Pacific Transducer
Pyrometer Instr. Co.
Simpson Electric
Thwing-Albert

PYROMETRS, Potentiometric

Bailey Meter Co.
Barber-Coleman
Blue M Electric
Bristol Co.



BAILEY

Resistance Thermometer

● Platinum resistance temperature element measures —400F to + 1200F; transmits to precalibrated "plug-in" type receivers in Bailey a-c PYROTRON Receiver Recorder.

One to four continuous temperature records are made on a single 12 in. circular chart. Each recording pen responds instantly since it is controlled by a separate inertia-free electronic detector. Each detector has its own power supply. A small reversible electric motor balances the a-c Wheatstone bridge circuit, and drives the indicating, recording, and controlling features. The Bailey a-c PYROTRON Receiver Recorder may be furnished with pneumatic or electrical control.

Any combination of electrically or pneumatically transmitted factors may be combined with temperature in the same recorder which features continuous, one-year, automatic inking.

Request Product Specification E12-5 for Receiver Recorder and E51-6 for Resistance Temperature Elements and Protecting Wells.

BAILEY METER COMPANY
1041 IVANHOE ROAD CLEVELAND, O.
Bailey Meter Company Ltd. Montreal, Canada

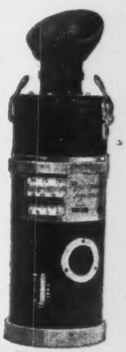
For more information circle **296** on inquiry card.

PYRO
INSTRUMENTS
FOR PRECISION
TEMPERATURE
MEASUREMENTS

PYRO
Optical Pyrometer

Determines temperatures of minute spots, fast-moving objects and smallest streams—at a glance! No correction charts or accessories needed. Easy to use—weighs only 3 lbs. Special types available to show true spout and pouring temperatures of molten ferrous metal measured in open. Five stock ranges from 1400° F. to 7700° F.

Write for FREE Catalog No. 85.



THE IMPROVED PYRO
Surface Pyrometer

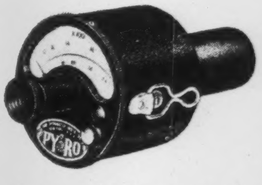
The ideal instrument for all plant and laboratory surface and sub-surface temperature measurements. Available with large selection of thermocouples and extension arms for all jobs. Designed for ruggedness and accuracy . . . it features automatic cold end compensation, large 4¾" direct reading dial and shock, moisture and dust-proofed shielded steel housing. 5 stock ranges 0-300°F. to 0-1200°F.

Ask for catalog No. 168.

PYRO
Radiation Pyrometer

Tells spot temperatures instantly in heat-treating furnaces, kilns forgings and fire boxes. No thermocouples, lead wires or accessories needed! Temperature indicated on direct reading dial at a press of the button. Any operator can use it. Two double-ranges from 1000° F. to 3400° F.

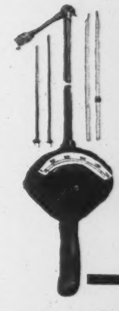
Write for FREE Catalog No. 100.



PYRO
Immersion Pyrometer

The Pyro Immersion Pyrometer is shock proof, moisture proof, dust proof, immune to magnetic influences. Shielded steel housing. Instantly interchangeable thermocouples without adjustment or recalibration. Large 4" scale. Equipped with exclusive **Lock Swivel.** Ranges 0-1000 to 0-2500 F.

Get FREE Catalogue No. 155.

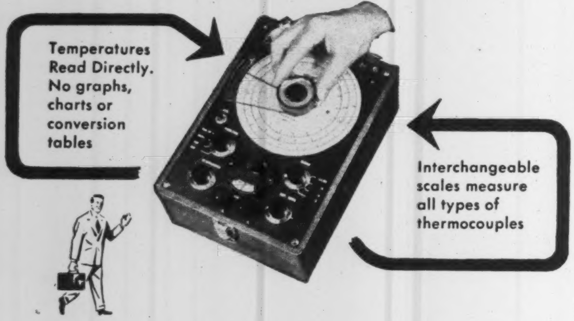


The Pyrometer Instrument Co.
Bergenfield 4, New Jersey

Manufacturers of PYRO Optical, MICRO-OPTICAL, SURFACE, RADIATION, IMMERSION and INDICATING PYROMETERS for over 25 years. Catalogs on request.

For more information circle **297** on inquiry card.

The only portable potentiometer pyrometer with interchangeable direct-reading scales



Temperatures Read Directly. No graphs, charts or conversion tables
Interchangeable scales measure all types of thermocouples

...checks and calibrates all types of temperature instruments.

"Pyrotest" is the most versatile instrument of its type. Compact, rugged, easy to carry (12 lbs. . . . 12¼" x 9" x 8½"). Accurate to ⅙ of 1%. 5 instruments in one—with a scale for every use, interchangeable in 30 seconds. Self-contained power supply. Write for free Bulletin 112.

TECHNIQUE

TECHNIQUE ASSOCIATES, INC.
414 TRANSPORTATION BLDG.
INDIANAPOLIS 25, IND.

For more information circle **298** on inquiry card.

Cambridge Instr. Co.
Co-design Corp.
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Rubicon Co.
Simpson Electric
Technique Assocs.
Thermo-Electric Co.
Thwing-Albert
West Instr. Corp.
Weston Electcl. Instr.
Wheelco Instr. Div.

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Bacharach Indust. Instr.
Bailey Meter Co.
Barber-Colman
Barnes Engrg. Co.
Beede Electcl. Instr. Co.
Blue M Electric
Bristol Co.
Cambridge Instr. Co.
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Co-design Corp.
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Electronics Corp. of Amer.
Elematic Equipt. Corp.
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Epic Inc.
Fielden Instr. Div.
Foxboro Co.
GE
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Hagan Corp.
Hanson-Gorrill-Brian
Herman, Victor George
Illinois Testing Labs.
Leeds & Northrup
Lewis Engrg. Co.
Minneapolis-Honeywell
  Indust. Div.
Olympic Development
Pyrometer Instr. Co.
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Simpson Electric
Thwing-Albert
West Instr. Corp.
Wheelco Instr. Div.
Williamson Devel. Co.

PYROMETERS, Surface, see Thermometers, Surface

PYROMETERS, Thermo-electric, Indicating, Recording and/or Controlling

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Alfax Paper & Engrg.
Assembly Products
Bacharach Indust. Instr.
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Barber-Colman
Beck Co.
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Fielden Insts.
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GE, Apparatus Sales
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Hagan Corp.
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Hanson-Gorrill-Brian
Hebler Co.
Herman, Victor George
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Partlow Corp.
Physics Research
Pimex, Inc.
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Pyrometer Instr. Co.
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Robertshaw-Fulton
Roller-Smith
Rubicon Co.
Scientific Instr. Co.
Sensitive Res. Instr.
Servo Corp.
Simpson Electric
Standard Tool & Mach.
Tamms Silica Co.
Taylor Instr. Cos.
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Technique Assocs.
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Thermo Electric Mfg. Co.
Thwing-Albert
Tube Light Engrg. Co.
Welch Mfg. Co., W. M.
West Instr. Corp.
Westronics, Inc.
Wheelco Instr. Div.
Winslow Co.

PYROMETRIC CONES

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Amer. Instr. Co.
Central Scientific
Fish-Schurman
Gordon Co., Claud S.
Henderson & Co.
Humboldt Mfg. Co.
Orton, Jr., Cer. Found.
Precision Scientific
Riehle Div.
Soiltest, Inc.

PYROMETRIC PAINT, see Temperature Sensitive Paint and Crayons

Q METERS

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Clough-Brengle
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GE
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Kahn & Co.
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New London Insts.
Technology Instr. Div.
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QUARTZ CRYSTALS, see Optical Parts, also Crystals, Piezoelectric

QUARTZ, Fused

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Andersen Labs.
Brazilian Trading Co.
Cal-Astro Optical Labs.
Cleveland Process Co.
Corning Glass Works
Edna Lite Optical
Esco Products
Fish-Schurman
GE
Glasscraft Co.
Greiner Glassblowing Lab.
Hanovia Chem. & Mfg.
Houston Technical Lab.
Instrument Tool & Engrg.
International Optical
International Prods. Corp.
Laboratory Equipt. Corp.
Machlett & Son
Mann Co., Wm. I.
Miller Labs., August E.
Palos Optical Co.
Prec. Glass Prod. Co.
Thermal Syndicate, Ltd.
Unertl Optical
Torrance Glass & Color
Valpey Crystal Corp.

QUARTZ APPARATUS, see Laboratory Apparatus

QUICK-DISCONNECT FITTINGS, see Fittings, Quick-Disconnect

RACKS, Cable and Tubing, see Tubing Supports

RACKS, including Chassis and Precision

Aerovox Corp.
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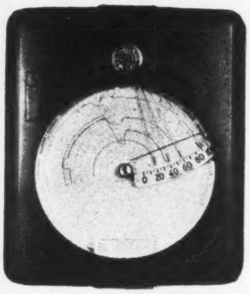
Artisan Metal Works
Bud Radio, Inc.
Cinema Engrg. Co.
Electric Tachometer Corp.
Ferner Co.
Gold Seal Mfg. Co.
Howard Clock
Hycon Electronics
Ingersoll-Waterbury Div.
Instrument Gear Wks.
Johnson Co., E. F.
Karp Metal Prods. Co.
Lewyt Corp.
Lynn, Robert M.
Mass. Gear & Tool Co.
Mico Instr. Co.
Par-Metal Prods. Corp.
Pneumafil Corp.
Pratt & Whitney
Premier Metal Prods.
Reiner Electronics
Suffolk Prods. Corp.
Technical Soldering Co.
Triplex Mach. Tool Co.
Ventrak Corp.

RACKS, Steel, for Capacitors, Resistors, Transformers, etc.

Alden Products
Alden Systems Co.
Amer. Electroneering
Artisan Metal Works
Bud Radio, Inc.
Engrg. & Research Corp.
Falstrom Co.
Industrial Engrg. Corp.
Instrof Inc.
Kirk & Blum
Par-Metal Prods. Corp.
PIC Design Corp.
Pneumafil Corp.
Reiner Electronics
Simplex Time Recorder
Suffolk Prods. Corp.
Unistrut Prods. Co.

RADAR

Advanced Electronics
Air Associates
Airborne Instruments
Aircraft Radio
Amerac Inc.
Amer. Electroneering
Autonetics Div.
Avion Div.
Bendix-Pacific
Cal-Tronics Corp.
Canoga Corp.
Cardwell Mfg. Corp.
Collins Radio Co.
Computer Co. of Amer.
Daystrom Instrument
Decker Aviation
DeMornay-Bonardi
F. R. Machine Works
Farnsworth Electronics
Goodyear Aircraft
Lab. for Electronics
Lavoie Labs.
Levinthal Electronic Prods.
Magnetic Research
Manson Labs.
Maxon Corp., W. L.
Natl. Aircraft Corp.
New Jersey Electronics
Norden-Ketay
Nuclear Corp. of Amer.
Phebco, Inc.
Philco Corp.
Pitometer Log Corp.
RCA Div.
Radiation, Inc.
Radio Receptor Co.
Raytheon Mfg. Co.
Seismograph Service
Servo Corp. of Amer.
Sperry Gyroscope Co.
Stavid Engineering, Inc.
Sterling Prec. Corp.
Texas Insts. Inc.



BAILEY

Electronic Pyrometer

• This indicating, recording, and controlling Bailey d-c PYROTRON Receiver Recorder is a self-balancing potentiometer which records one to four continuous temperature records on a 12 in. circular chart. It may be furnished with pneumatic or electric control. A themocouple or a radiation unit is the temperature sensitive element.

Minimum maintenance is assured by the elimination of galvanometers, millivolt meters, batteries and standard cells. A reversible electric motor, under electronic control, balances the potentiometer circuit and drives the indicating, recording, and controlling features.

Bailey PYROTRON Receiver Recorders are made up of interchangeable "plug-in" assemblies, standardized so that only a few spare parts need be carried in stock for many instruments.

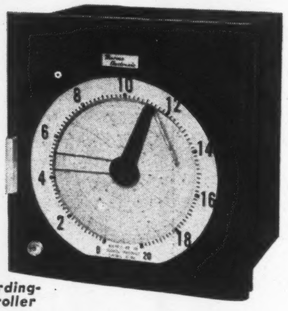
Request Product Specifications E12-5 and E12-4.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For more information circle **299** on inquiry card.

PYROMETERS

T-E has combined advanced design with quality performance in a wide variety of pyrometric instruments.



Recording-Controller

Indicators
Self balancing, manual balancing, millivoltmeter. Standard and Portable.

Controllers
Indicating, signalling, recording.

Recorders
Circular chart-indicating. Standard and portable.

Other T-E Instruments

"AutoRef"—providing single and multiple circuit cold-junction compensation • Temperature Monitoring Systems • Thermocouple Calibration Console • Resistance Thermometer Instruments.

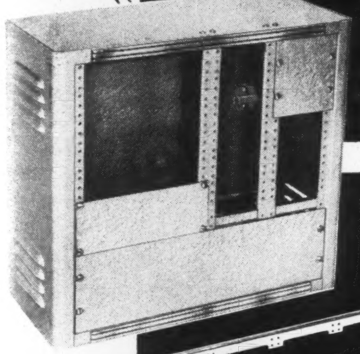
Write for Instrument Bulletin FF

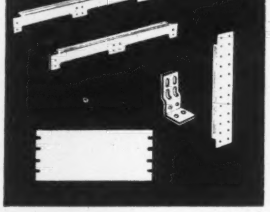
Thermo Electric Co. Inc.
Saddle Brook, New Jersey

In Canada—
Thermo Electric (Canada) Ltd., Brampton, Ont.

For more information circle **300** on inquiry card.

for modular construction of test equipment!





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for use with standard 19", 9½", 4¾" wide panels

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Assembly Products
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Berkeley Div.
Daytronic Corp.
Detectolab, Inc.
El-Tronics, Inc.
GE, Apparatus Sales
Georator Corp.
Jordan Electronics
Kybernetes Corp.
Menlo Research Lab.
Microchemical Specialties
NRD Instr. Co.
Nuclear Corp. of Amer.
Nuclear Instr. & Chem.
Nuclear Measmts. Corp.
Nuclear Research
Ohmart Corp.
Radiation Counter Labs.
Radiation Instr. Dev. Lab.
Radiation Res. Corp.
SCAM Instr. Corp.
Servo Corp. of Amer.
Tracerlab, Inc.
United Engineers, Inc.
Univ. Atomics Corp.
Victoreen Instr. Co.
Western Radiation Lab.
Yarnall-Waring

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Baird Assocs.-Atomic Instr.
Ballantine Labs.
Barnes, Engrg. Co.
Beckman & Whitley
Biddle Co., James G.
Bristol Co.
Cambridge Instr. Co.
Co-design Corp.
Computer Corp. of Amer.
Conax Corp.
Engelhard, Chas. Co., Inc.
Eppley Lab.
F. R. Machine Works
Farrand Optical
Field Elect. Instr.
Gaertner Scientific
General Controls Co.
Gordon Co., Claud S.
Harrison & Harrison
Hastings-Raydist
Hewlett-Packard
Illinois Testing Labs.
Jarrel-Ash
Jordan Electronics
Mt. Sorpis Instr. Corp.
Narda Corp.
Perkin-Elmer
Pioneer Electronics
Polytechnic Res. & Devel.
Pyrometer Instr. Co.
Radiation Counter Labs.
Radiation Res. Corp.
Rawson Electcl. Instr.
Revere Corp.
Ruge Assocs.
Servo Corp. of Amer.
Sierra Electronic Corp.
Sperry Gyroscope Co.
Thermo-Electric Co.
Thermometer Corp.
Thwing-Albert
United Control
Victoreen Instr. Co.
WacLine, Inc.
Williamson Devel. Co.

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Airborne Instruments
Avion Div.
Beacon Gage Co.
Canoga Corp.
Federal Telephone & Radio
Islip Radio Mfg.
Natl. Aircraft Corp.
Radio Receptor Co.
Ramo-Wooldridge
Servo Corp. of Amer.
Stavid Engineering, Inc.
Wallace & Tiernan

RADIO DIRECTION FINDERS, see Direction Indicators

RADIO FREQUENCY METERS
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Aero Instr. Co.
Amer. Electroneering
Berkeley Div.
Boonton Radio
Burlington Instr. Co.
Clough-Brengle
Computer Co. of Amer.
Dale Instruments
DeJur-Amsco
Diatron Co.
Donner Scientific
Electronic Devel. Lab.
Electro Prods. Lab.
F. R. Machine Works
Federal Telephone & Radio
Feiler Engrg. Co.
Ferris Instr. Corp.
GE
General Radio Co.
Gertsch Products
Hewlett-Packard
Hickok Electcl. Instr.
Hycon Electronics
Internat. Instruments
Jerrold Electronics
Jersey City Tech. Lab.
Kay Electric
Kearfott Co.
Lampkin Lab., Inc.
Lavoie Labs.
Marconi Instruments
Measurement Corp.
Meters, Inc.
Millen Mfg. Co.
Millivac Instruments
National Co., Inc.
New London Instr. Co.
Polytechnic Res. & Dev. Co.
Potter Instr. Co.
Premier Crystal Labs.
Ransom Research
Rawson Electcl. Instr.
RCA Div.
Roller-Smith
Sensitive Res. Instr.
Servo Corp. of Amer.
Simpson Electric
Sherron Metallic Corp.
Sperry Gyroscope Co.
Std. Electronic Res.
Sylvania Elect. Prods.
Teletronics Lab.
Triplett Electcl. Instr.
Virginia Electronics
WacLine, Inc.
Walkirt Co.
Westinghouse Electric
Weston Electcl. Instr.

RADIO FREQUENCY OSCILLATORS, see Oscillators, Radio-Frequency

RADIO REMOTE CONTROL SYSTEMS, See Telemetering Systems, RF

RADIO SET ANALYZERS, see Analyzers, Radio Set, also Circuit Testers

RADIO TUBE CHECKERS, see Tube Testers, Electron

RADIOACTIVE DIALS and POINTERS
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Automation Equipt., Inc.
Can. Radium & Uranium
Maryland Etching Co.
Miller Dial & Name Pl.
Nuclear Corp. of Amer.
Photo Chemical Prods.
Sampson Chem. & Pigm.
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General Chemical Div.
Instruments, Inc.
Isotope Prods. Inc.
Norden-Ketay
Nuclear-Chicago
Nuclear Corp. of Amer.
Nuclear Research Corp.
Res. Specialties
Tracerlab Inc.
U. S. Radium Corp.
Western Radiation Lab.

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Alco Mfg. Co.
Amer. Electronic Labs.
Amer. Electronics
Amer. Instr. Co.
Amer. Tradair Corp.
Amperex Electronics
Anton Electronic Labs.
Applied Physics Corp.
Atomic Research Corp.
Atomlab, Inc.
Austin Co.
Autom. Temp. Contr. Co.
Baird Assocs.-Atomic Instr.
Baldwin-Lima-Hamilton
Bar-Ray Products
Bendix-Cincinnati
Berkeley Div.
Beva Laboratory
Bogue Electric Mfg.
Bristol Co.
C.G.S. Labs.
Cambridge Instr. Co.
Central Scientific
Century Geophysical
Chatham Electronics Div.
Clairex Corp.
ConRay Corp.
Consol. Electrodynamics
Consol. Vacuum Corp.
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Curtiss-Wright
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Daystrom Instrument
Detectolab, Inc.
Detectron Co.
Distillation Products
Douglas Instr. Lab.
Douglas Radio Labs.
Eitel-McCullough
El-Tronics Inc.
Electrical Devel. Co.
Electronic Prods. Co.
Farnsworth Electronics
Ferner Co.
Fisher Research Lab.
Flett Lab.
Forro Scientific
GE, Apparatus Sales
GE, Instrument Dept.
GE, X-Ray Dept.
General Radio
Geophysical Instr. Co.
Georator Corp.

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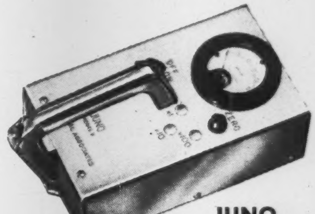
Manufacturers of Scale-O-Matic counting circuits, Geiger counter tubes, scintillation counters, civilian defense instruments, chemical dosimeters, portable radiation detectors, and lead shields.



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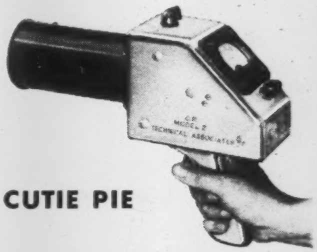

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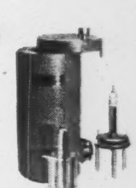

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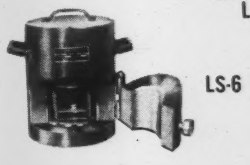

LS-6

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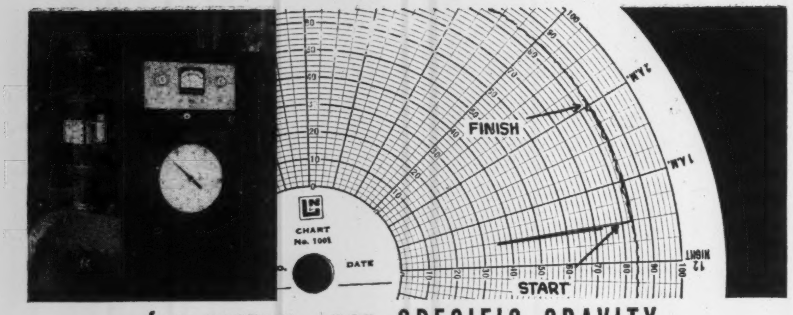
Burbank, California

For more information circle **302** on inquiry card.



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with 1% of scale precision*

NO moving parts and

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With an Ohmart Gage you are assured of minimum sampling error—the measurement is made directly on the pipe containing the material by means of gamma ray absorption and the exclusive Ohmart Cell.

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Instruments Inc.
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Kelley-Koett
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Marconi Instruments
Martin-Hubbard
Menlo Research Lab.
Mitchell Radiation Prods.
Moran Instr. Corp.
Mt. Sornis Instr. Corp
NRD Instr. Co.
National Radiac, Inc.
New London Instr. Co.
Norden-Ketay
North Amer. Philips Co.
Nuclear-Chicago
Nuclear Corp. of Amer.
Nuclear Devel. Lab.
Nuclear Measmts. Corp.
Nuclear Research Corp.
Nuclear Science
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Potter Instr. Co.
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Radiation Instr. Dev. Lab.
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Rowe Engrg. Co.
Sangamo Electric
Scientific Specialties
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Servo Corp. of Amer.
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Special Instruments Lab.
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Standard Scientific Supply
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Stratex Instr. Co.
Sylvania Elect. Prods.
Technical Assocs.
Technical Measmts. Corp.
Tracerlab Inc.
United Engineers, Inc.
Univ. Atomics Corp.
Vacuum Tube Prods.
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Walkirt Co.
Wang Labs.
Welch Allyn, Inc.
Westport Electric
Western Radiation Lab.
Wood Counter Lab., N.
Zenith Optical

RADIOACTIVITY STANDARDS, see Standards, Radioactivity

RADIOGRAPHY, see Flaw Detection, X-ray, also X-ray Equipment

RADIO-MICROMETERS, see Dimensional Gages, Electronic, also Thickness Gages

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GE
Kollsman Instrument
Pacific Div.
Reiner Electronics
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Shasta Div.
Tenney Engineering
Victory Engrg. Corp.
Wallace & Tiernan

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Anton Electronic Labs.
Atomlab Inc.
Bar-Ray Products
Can. Radium & Uranium
Corbett Science Labs.
El-Tronics Inc.
Instruments, Inc.
MRD Instrument
Nuclear-Chicago
Radiation Counter Labs.
Tracerlab Inc.
United Engineers, Inc.
Universal Atomic
Western Radiation Lab.

RADIUM PAINT, see Luminescent Materials

RAIL TESTING MACHINES, see Flaw Detection and Flaw Detector Cars

RAIN GAGES, see Hydrologic Instruments

RAINFALL RECORDERS, see Hydrologic Instruments

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American Electroneering
Bauch & Lomb
Bendix Aviation
Davidson Mfg. Co.
Daystrom Instrument
Farrand Optical
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Fisher Research Corp.
Gaertner Scientific
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Internat. Devel. Co.
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Kollmorgen Optical
Leitz, Inc.
Meyer-Opticraft
Natl. Aircraft Corp.
Norden-Ketay
Penn Optical & Instr.
Prec. Thermom. & Insts.
QOS Corp.
RCA Div.
Servo Corp. of Amer.
Stafford Co.
Testa Mfg. Co.
Torp Industries
White Co.
Wild Heerbrugg

RANGE POLES, see Surveying Instruments

RATE OF CLIMB INDICATORS, see Aircraft Instruments

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Daven Co.
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Pimex, Inc.
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RATIO CONTROLLERS, see Flow Proportioning

REACTANCE METERS, see Impedance Measuring Instruments

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REACTIVE VOLT-AMPERE METERS, see Volt-ampere Meters, Reactive

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California Magnetic
Cambridge Thermionic
Carad Corp.
Chicago Electronic Engrg.
Chicago Std. Transf. Corp.
Clough-Brengle
Control Corp.
Del Electronics
Dittmore & Freimuth
Electronic Transf. Co.
F. R. Machine Works
Federal Telephone & Radio
Femco, Inc.
Ferranti Electric
Ford Instr. Co.
Freed Transf. Co.
GE
General Instr.
Goslin Elect. & Mfg. Co.
Gramer-Halldorson Corp.
Gudeman Co.
Harvey Radio Labs.
Hevi Duty Electric Co.
High Pressure Equipt. Co.
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International Resistance
Jeffries Transf. Co.
Kenyon Transf. Co.
Knopp, Inc.
Macarr, Inc.
Madison Elect. Prods.
Magnetics, Inc.
Mallory & Co., P. R.
Merit Transf. Corp.
NJE Corp.
NYT Electronics
National Co., Inc.
New Jersey Electronics
New London Instr. Co.
New York Transf. Co.
Ohmite Mfg. Co.
Opad Electric
Osborne Electric
Pacific Instr. Co.
Radex Corp.
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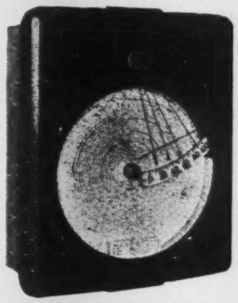

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Bailey Meter Company Ltd., Montreal, Canada

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Technical App. Builders
Texas Insts., Inc.
Thermador Elect. Mfg.
Thordarson-Meissner
Torwico Electronics
Transformer Engrs.
Transformers, Inc.
Trenton Transf. Corp.
Triad Transf. Corp.
United States Electronics
United Transf. Corp.
Wheeler Insul. Wire, Inc.

REACTORS, Saturable, see Amplifiers, Magnetic

READING LENSES, Thermometer and Burette, see Lenses, Bullseyes

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Bendix-Pacific
Bristol Co.
Collins Radio Co.
Electronic Tube Corp.
Farnsworth Electronics
Foxboro Co.
Fischer & Porter Co.
Hays Corp.
Henschel Corp.
Infilco Inc.
Manning, Maxwell & Moore
Photobell Co.
Scientific Instr. Co.
Shand & Jurs
Simplex Valve & Meter
Sparton Cont. Systems
Sterling Prec. Instr.
Swartwout Co.
Taber Instr. Corp.

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B-I-F Industries
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Brooks Rotameter
Crosby Steam Gage
Ellison Draft Gage Co.
Fischer & Porter Co.
Foxboro Co.
Hays Corp.
Indust. Instr. Corp.
Infilco Inc.
Manning, Maxwell & Moore
Minneapolis-Honeywell
  Indust. Div.
Scientific Instr. Co.
Simplex Valve & Meter
Taylor Instr. Cos.
U. S. Gauge Div.

RECEIVER RECORDERS, Electric Signal

A-V Mfg. Corp.
Amer. Meter Co.
B-I-F Industries
Bendix-Pacific
Bristol Co.
Commercial Controls Corp.
Electronic Tube Corp.
Farnsworth Electronics
Fischer & Porter Co.
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Infilco Inc.
Leeds & Northrup
Manning, Maxwell & Moore
Penn Insts. Div.
Photocell Co.
Ramo-Wooldridge
Scientific Instr. Co.
Shand & Jurs
Simplex Valve & Meter
Swartwout Co.
Taber Instr. Corp.
Texas Insts., Inc.
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Bristol Co.
Dickson Co.
Fischer & Porter Co.
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Inflico Inc.
Leeds & Northrup
Mason-Neilan Div.
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  Indust. Div.
Penn Insts. Div.
Powers Reg. Co.
Scientific Instr. Co.
Simplex Valve & Meter Co.
Stoelting Co.
Taylor Instr. Cos.
U. S. Gauge Div.

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Alden Systems
Amer. Platinum Wks.
Amer. Recording Chart
B-I-F Industries
Baker & Co.
Barton Instr. Corp.
Bishop & Co., J.
Bristol Co.
Brush Electronics
Consol. Molded Prods.
Dickson Co.
Edin Co.
Everett Prods. Inc.
Farrand Optical
Fielden Instr. Div.
GE
Geotechnical Corp.
Hunter Mfg. Co.
Impact Register Co.
Jensen Tool Co.
Larson Instr. Co.
Leeds & Northrup
Moeller Instr. Co.
Nester Co., L. G.
Scientific Instr. Co.
Stoelting Co.
Swissomatic Products
Trerice Co.

RECORDERS, Circular Chart (see also Object of Measurement)

Alina Corp.
Amthor Testing
Autom. Temp. Contr. Co.
B-I-F Industries
Baldwin-Lima-Hamilton
Barton Instr. Corp.
Bristol Co.
Dickson Co.
Edin Co.
Elect. Auto-Lite Co.
Ess Instr. Co.
Fielden Instr. Div.
Fischer & Porter Co.
Foxboro Co.
General Controls Co.
Hays Corp.
Johnson Service Co.
Larson Instr. Co.
Leeds & Northrup
Manning, Maxwell & Moore
Mason-Neilan Div.
Minneapolis-Honeywell
  Indust. Div.
Moeller Instr. Co.
Palmer Thermometers
Partlow Corp.
Penn Insts. Div.
Powers Reg. Co.
Republic Flow Meters
Scientific Instr. Co.
Simplex Valve & Meter
Sparling Meter Co.
Taber Instr. Corp.
Taylor Instr. Cos.
Trerice Co.
U. S. Gauge Div.
Weksler Thermom. Corp.
Weston Electcl. Instr.

RECORDERS, Electrosensitive

Alden Electron. & Impulse
Alden Systems Co.
Alfax Paper & Engrg.Co.
Barnes Engrg. Co.
Bendix-Pacific
Bristol Co.
Brush Electronics
Century Electronics & Insts.
Consol. Electrodynamics
Edin Co.
Electro Instr. Inc.
Lab-Tronics
Larson Instr. Co.
Offner Electronics
Radiation Inc.
Ram Meter, Inc.
Scientific Instr. Co.
Stoelting Co.

RECORDERS, Magnetic Tape

A-V Mfg. Corp.
American Electronics
Ampex Corp.
Amplifier Corp. of Amer.
ANelex Corp.
Automation Corp. of Amer.
Autonetics Div.
Brush Electronics
Century Electronics & Insts.
Consol. Electrodynamics
Cook Electric
Davies Labs.
Electro-Techn. Labs.
Fairchild Recording
Geotechnical Corp.
Kay Electric
Kinevox Div.
Magnecord, Inc.
Minnesota Mining & Mfg.
Potter Instr. Co.
Presto Recording
RCA
Ramo-Wooldridge
Southw. Ind. Electronic
Technical Instr. Co.
Texas Insts., Inc.
Vectron, Inc.

RECORDERS, Multipoint

Acton Labs.
Alden Electron. & Impulse
Alden Systems Co.
B-I-F Industries
Baldwin-Lima-Hamilton
Barber-Colman
Bristol Co.
Brush Electronics
Century Electronics &
  Insts.
Consol. Electrodynamics
Epic Inc.
Fielden Instr. Div.
Fischer & Porter Co.
Foxboro Co.
Gilmore Industries
Lab-Tronics
Larson Instr. Co.
Leeds & Northrup
Mid-Century Instrumatic
Minneapolis-Honeywell
  Indust. Div.
Potter Instr. Co.
Radiation Inc.
Reeves Instr. Corp.
Republic Flow Meters
Royson Engrg. Co.
Schaevitz Engineering
Scientific Instr. Co.
Taylor Instr. Cos.
Thwing-Albert
Weston Electcl. Instr.

RECORDERS, Numerical Data, see Printers

RECORDERS, Oscillograph, see Oscillographs

RECORDERS, Potentiometer, see Potentiometers

RECORDERS, Strip Chart (see also the Object of Measurement)

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Alina Corp.
Autom. Temp. Contr. Co.
B-I-F Industries
Baldwin-Lima-Hamilton
Barber-Colman
Bendix-Pacific
Berkeley Div.
Bristol Co.
Elect. Tachometer Corp.
Fischer & Porter Co.
Foxboro Co.
General Controls Co.
GE, Apparatus Sales
Hunter Mfg. Co.
Instruments Corp.
L & O Res. & Dev. Corp.
Larson Instr. Co.
Leeds & Northrup
Manning, Maxwell & Moore
Massa Labs.
Menlo Research Lab.
Mid-Century Instrumatic
Minneapolis-Honeywell
  Indust. Div.
Offner Electronics
Orban Co.
Phoenix Prec. Instr.
Photron Instr. Co.
Republic Flow Meters
Schaevitz Engineering
Simplex Valve & Meter
Sound Apparatus Co.
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Stoelting Co.
Swartwout Co.
Taylor Instr. Cos.
Technical Instr. Co.
Tech. Prods. Co.
Texas Insts., Inc.
Thwing-Albert
Times Facsimile Corp.
Varian Assocs.
West Instr. Corp.
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RECORDERS, X-Y, see X-Y Recorders, also Curve Followers

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Davies Labs.
Librascope, Burbank Div.
Magnecord, Inc.
Monroe Calc. Mach. Co.
Potted Instr. Co.
Southw. Ind. Electronics
Sure Brothers
Underwood Corp.

RECORDING PAPERS, see Charts

RECTIFIERS, Dry Disc, including Copper Oxide, Germanium, Selenium, Silicon (see also Rectifiers, Power)

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Arnhold Ceramics, Inc.
Automatic Electric
Automatic Mfg.
Bart-Messing
Bogue Elect. Mfg.
Bradley Labs.
Conant Labs.
Control Corp.
Dearborn Scientific
DeJur-Amsco
Electronic Rectifiers
Electrosig Corp.
Fansteel Metallurgical
Federal Telephone & Radio
GE, Apparatus Sales
GE, Electronics Div.
Germanium Prods. Corp.
Green Rectifier
Hansen Co., Wm.
Hughes Prods. Div.
Inet, Inc.
International Rectifier
International Resistance
Knopp, Inc.
La Marche Mfg. Co.
Leland, Inc.
Mallory & Co., P. R.
McColpin-Christie
Opad Electric
Pac. Semiconductors, Inc.
Perkin Engrg. Co.
Physics Research Labs.
Pyramid Electric
Radio Receptor Co.
Rapid Electric
Raytheon Tube Div.
Richardson-Allen
Schauer Mfg. Corp.
Shasta Div.
Sorenson & Co.
Standard Arcturus Corp.
Standard Elect. Time
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Union Switch & Signal
U. S. Instr. Corp.
Vickers Elect. Div.
Walker Div.
Westinghouse Electric
Weston Electcl. Instr.

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Bendix Aviation Corp.
Bradley Labs.
Eitel-McCullough
GE, Apparatus Sales
GE, Tube Dept.
Industro, Inc.
Lewis & Kaufman
Mallory & Co., P. R.
Nuclear Corp. of Amer.
Opad Electric
Philco Corp.
Techn. App. Builders
Vacuum Tube Prods.

RECTIFIERS, Mercury Vapor

Amperex Electronics
Continental Electric
Eitel-McCullough
Electronic Products Co.
Electrosig Corp.
Federal Telephone & Radio
GE, Apparatus Sales
GE, Tube Dept.
Internat. Std. Trading
Nuclear Corp. of Amer.
Opad Electric
Perkin Engineering
Pioneer Electronics
Raytheon Mfg. Co.
RCA
Richardson-Allen
Sylvania Elect. Prods.
Techn. App. Builders
Walker Div.

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Allis-Chalmers
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Amer. Rectifier
Amer. Transf. Co.
Amplifier Co.
Applied Research Labs.
Automatic Electric
Automatic Mfg.
Bart-Messing
Bendix, Eclipse-Pioneer
Bogue Elect. Mfg.
Bradley Labs.
Chatham Electronics
Continental Electric

Cutler-Hammer
Dittmore & Freimuth
Eitel-McCullough
Electro Prods. Labs.
Electronic Labs., Inc.
Electronic Prods. Co.
Electronic Rectifiers
Electrons, Inc.
Electrosig Corp.
Electro-Tech Equipt.
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GE, Apparatus Sales
GE, Electronics Div.
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Heller Co.
Huggins Labs.
Inet Div.
International Rectifier
Knopp, Inc.
La Marche Mfg. Co.
Lambda Electronics
Macarr, Inc.
Magnatran Inc.
Magnetic Instr. Co.
Magnetic Res. Corp.
Mallory & Co., P. R.
McColpin-Christie
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Opad Electric
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Vickers Electric Div.
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Chatham Electronics
Communication Meas. Lab.
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DuMont Labs., Inc., A. B.
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Electrons, Inc.
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Heller, Gerald K.
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NuClear Corp. of Amer.
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Howland Optical
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Laboratory Specialties
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Leroy Clausing Co.
Lindly & Co.
Lynn, Robert M.
Mann Co., W. I.
Marsco Mfg. Co.
Merry Instr. Co.
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Optical Film Engrg.
Optron Laboratory
Pacific Optical
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Penn Optical & Inst.
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Testa Mfg. Co.
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Tinsley Labs.
Topp Industries
Unertl Optical
Webber Gage
Weber Bros. Metal Wks.
Zenith Optical Co.
Zenith Optical Lab.

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Beseler Co.
Buhl Optical
Corning Glass Works
E & S Optical
Esco Prods. Co.
Fish-Schurman
Gordon Enterprises
Helio Instr. Co.
Houston Technical Labs.
Internat. Devel. Co.
Laboratory Optical
Lampkin Labs., Inc.
Lancaster Lens
Leroy Clausing Co.
Lynn, Robert M.
Mann Co., W. I.
Merry Instr. Co.
Optron Laboratory
Palos Optical
Perkin-Elmer
Regal Instr. Co.
Simpson Optical
Zenith Optical Lab.

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Georator Corp.
Gordon Enterprises
Helio Instr. Co.
Internat. Devel. Co.
Kollmorgen Optical
Lab. Optical Co.
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Perkin-Elmer
Regal Instr. Co.
Unertl Optical
Zenith Optical Lab.

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Sarco Co., Inc.
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Taylor Instr. Cos.
Thermometer Corp.
United Elect. Controls
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White-Rodgers

REGISTERS, Magnetic Shift, see Magnetic Shift Registers

REGULATORS, see Object of Measurement and Control, e. g. Flow Regulators, Temperature Regulators, etc.

REGULATORS, Air and/or Gas, see Pressure Regulators, Air

REGULATORS, Boiler, see Boiler Room Instruments

REGULATORS, Current, see Current Regulators

REGULATORS, Damper, see Boiler Room Instruments

REGULATORS, District, see Gas Distribution

REGULATORS, Flow, see Flow Regulators

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Automatic Electric
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Multi-Amp Corp.
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Potter & Brumfield
Simpson Electric
Standard Elect. Time
States Co.
Sun Electric
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Aemco Inc.
Aero Switch Div.
Airpax Products
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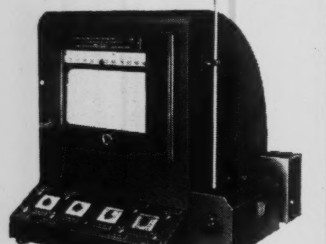
MEASURE AND RECORD THE DIFFERENCE
in refractive index with the NEW PHOENIX automatic recording differential refractometer



Instrument shown is for mass-collection laboratory use. Other models available for process use. Limiting sensitivity, 3 x 10⁻⁶; minimum range, 6600 units.

This instrument makes possible extremely accurate qualitative and quantitative analysis of hydrocarbons, alkaloids, steroids, antibiotics, etc., in non-opaque liquid streams . . . and easier, more accurate process control in chemical, petroleum, pharmaceutical and related industries.
Send for complete information.

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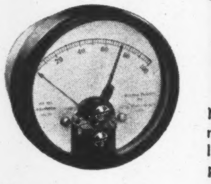
PHOENIX PRECISION INSTRUMENT CO.
3805 N. 5th St., Dept. B-1, Philadelphia 40, Pa.

For more information circle **306** on inquiry card.

METER-RELAYS

D'Arsonval indicating meters with built-in locking contacts for sensitive control or alarm.

Typical Applications:
- Radiation detection and alarm
- Automatic component testing
- Heat and pressure control
- Reactor protection
- Signal detection in radar warning systems
- pH control in automatic titration
- Speed control for machines and conveyors
- Control of evacuation pumps in vacuum tube mfg.
- Chemical process control
- Continuous monitoring of current and voltage
- Automatic prospecting
- Controlling rates of flow of bulk materials
- Automatic switching of standby microwave equipment
- Bearing temperature monitoring on pumps, turbines



Model 255-C
High limit,
Ruggedized-Sealed
0-100 Ua DC
$46.00
Narrow bezel permits longer scale length, takes less panel space.

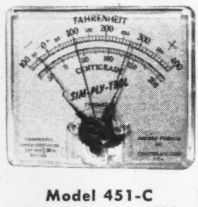
Operation:
Trip point adjustable to any point of scale arc. Sensitive to changes of less than 1%. One contact carried on moving pointer. The other on an adjustable pointer. When two pointers meet, contacts close and lock. Holding coil is wound directly over moving coil, locking action is electro-magnetic. Manual or automatic reset. Spring action in contacts kicks them apart.

D.C.
MICROAMPERES

Model 461-C Bakelite
Double Contact
10-0-10 Ua DC
$75.75

Styles:
RUGGEDIZED-SEALED metal cases are 2½, 3½, and 4½" round, shock-mounted movement, gasket-sealed.
BLACK BAKELITE . . . glass front, 4½" rectangular case. Other colors on special order.
CLEAR PLASTIC CASES 2½, 3¾, & 4½" rect.

Ranges:
0-5 Microamps to 0-50 Amps. 0-5 Millivolts to 0-500 volts, AC or DC. (Minimum AC voltage range 0-250 Mv.) Thermocouple temperature ranges cover from −400 to + 3000° F. Minimum full scale movement from one thermocouple is 300°F. Thermistors and thermopiles are used for more sensitive ranges.



Model 451-C
Double Contact −100 to +400°F.—**$64.00**

Environmental:
Typical ruggedized-sealed meter-relays will meet these specs:
Shock: 1 and 3-foot drops, 400 lb. hammer, 3 planes.
Vibration: MIL-M-10304A.
Salt Spray: QQ-M-151A.
Temp.: −30°/+70° C.
Sealing: MIL-M-6A.

Accuracy:
Point of contact: ¼% to 1%.
Indicating: ±2% of full scale at any point of dial. Can be 1% on request. Thermistor compensation can be supplied for ambient variation of 0 to 140°F.

Contacts:
Rating: Standard is 5-25 milliamperes at 75-125 volts DC. Can be to 100 milliamps at 6-125 Volts DC.
Arrangement: High Limit (makes on increase of signal), Low Limit (makes on decrease of signal), Double (both high and low contacts)
Life: 10 to 20 million operations.

Write for 40 page Catalog 4B.

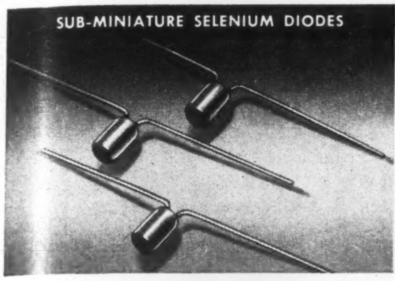
Assembly Products, Inc., Chesterland 30, Ohio. Phone: (Cleveland, O.) HAmilton 3-4436 (West Coast: Desert Hot Springs 30, Calif. Phone: 4-3133 & 4-2453).

For more information circle **307** on inquiry card.

International Rectifiers

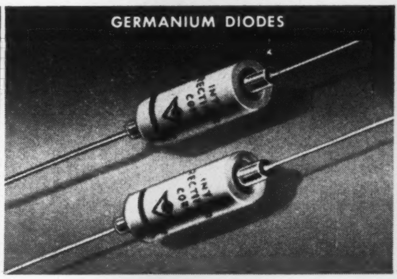
SELENIUM · GERMANIUM · SILICON

SUB-MINIATURE SELENIUM DIODES



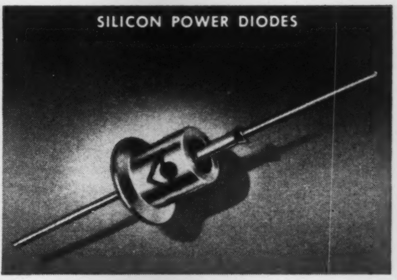
Developed for use in limited space at ambient temperatures ranging from −50°C to +100°C. Encapsulated to resist adverse environmental conditions. Output voltages from 20 to 160 volts; output currents of 100 microamperes to 11 MA. **Bulletin SD-1B**

GERMANIUM DIODES



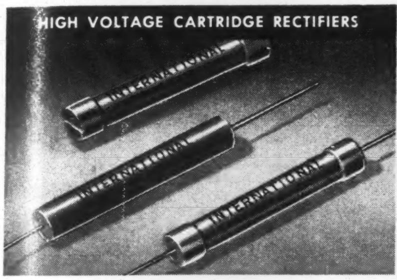
This series of general purpose, high quality point contact diodes provide excellent rectification efficiency for very high frequency applications. Special "RED DOT" series available for ambient temperatures from −55° C to +100° C. **Bulletin GD-2**

SILICON POWER DIODES



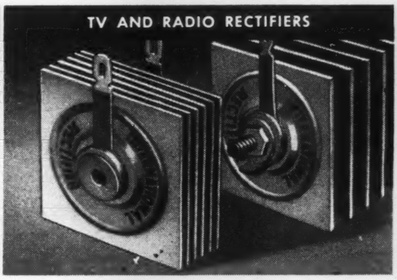
For temperature applications to 150° C, these fused junction diodes withstand exposure from −55° C to +170° C. Peak inverse voltage rating from 50 volts to 600 volts. Welded, hermetically sealed construction. Four types. **Bulletin SR-132**

HIGH VOLTAGE CARTRIDGE RECTIFIERS



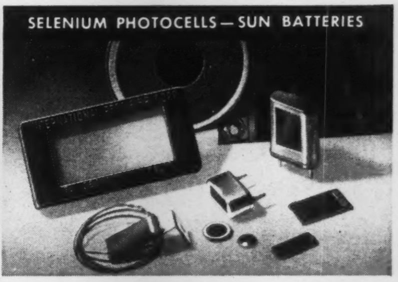
Designed for long life and reliability in Half-Wave, Voltage Doubler, Bridge, Center-Tap Circuits, and 3-Phase Circuit Types. Phenolic Cartridge and Hermetically Sealed types available. Operating temperature range: −65°C to +100°C. Specify **Bulletin H-2**

TV AND RADIO RECTIFIERS



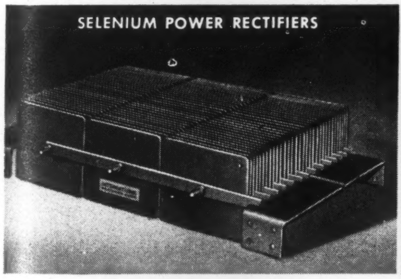
The widest range in the industry! Designed for Radio, Television, TV booster, UHF converter and experimental applications. Input ratings from 25 to 195 volts AC and up. DC output current 10 to 1,200 MA. Write for application information. **Bulletin ER-178-A**

SELENIUM PHOTOCELLS — SUN BATTERIES



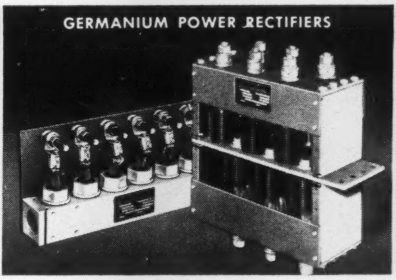
Self-generating photocells available in standard or custom sizes, mounted or unmounted. Optimum load resistance range: 10 to 10,000 ohms. Output from .2 MA to 60 MA in ave. sunlight. Ambient temperature range: −65°C to +100°C. **Bulletin PC 649**

SELENIUM POWER RECTIFIERS



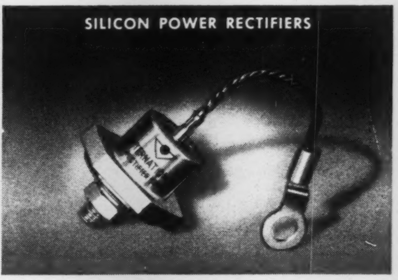
For all DC power needs from microwatts to kilowatts. Features: long life; compact, light weight and low initial cost. Ratings: to 250 KW, 50 ma to 2,300 amperes and up. 6 volts to 30,000 volts and up. Efficiency to 87%. Power factor to 95%. **Bulletin C-349**

GERMANIUM POWER RECTIFIERS



3 Styles featuring efficiency to 97%, low forward drop, high reverse to forward current ratio, unlimited life. Ratings: 26 to 66AC input v. per junction. 150 to 100,000 amps DC output. Operating temperature range: −55° C to +75° C. **Bulletin GPR-1**

SILICON POWER RECTIFIERS



High power- 5 amp to 100 amp- silicon fused junction type. Input ratings to 200 PIV. Temp. range: up to 150° C case temperature. Available in individual diodes or all usual power rectifier circuits. Data available on models for forced air and liquid cooling.

Bulletin SPR-1

a world of difference
through research!

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ALL PURPOSE
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A COMPLETE LINE OF CONTROLS SERVING AMERICAN INDUSTRY

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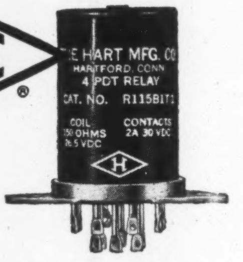

Versatile
'DIAMOND H'
Relays
Handle Many Different Jobs

"Diamond H" Series R hermetically sealed aircraft type relays perform outstandingly over such a broad area that they are frequently used to do many different types of jobs in a given application. For example, they give excellent reliability in dry circuits yet will carry up to 10 amperes in power circuits . . . or even 20 amperes for reduced life requirements.

Savings inherent in uniform size and mounting arrangements for one relay family can be multiplied by the lower inventory of spare parts needed when a single model is used for two or more functions. Matching or surpassing requirements of USAF Spec. MIL-R-5757B as well as important provisions of MIL-R-25018, tens of thousands of Series R 4 PDT and DPDT relays are in use, engineered for:

Various brackets of vibration resistance from 10 to 2,000 cps; temperature ranges from —65° to +200° C, coil resistances from 1 to 50,000 ohms, operational shock resistance of 30, 40 or over 50 "G" and mechanical shock resistance to 1,000 "G", contact capacities from 350 V., D. C., 400 MA, to 10 A., at 30 V., D. C., as well as signal circuits.

For complete information, send for a copy of Bulletin R-250.

THE HART MANUFACTURING COMPANY
219 Bartholomew Avenue, Hartford, Conn.

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Haydon Co., A. W.
Hedin Tele Technical
Henschel Corp.
Hetherington & Son
Hi-G, Inc.
Industrial Engrg. Corp.
Industrial Timer Corp.
Internat. Business Machs.
Jaidinger Mfg. Co.
Johnson Co., E. F.
Kahn & Co.
Kellogg Switchboard
Kinetic Instr. Co.
Kurman Electric
Lake Erie Electronic
Larson Instr. Co.
Leach Relay Co.
Lectronic Research Labs.
Lumenite Electronic
Luther Mfg. Co.
Mack Electric Devices
Magnecord Electric
Magnetic Amplifiers
Marion Electcl. Instr.
Mercoid Corp.
Milwaukee Gas
Minneapolis-Honeywell
Moore Products
National Time & Signal
North Electric
Ohmite Mfg. Co.
Palo Lab. Supply
Perfex Corp.
Phaostron Co.
Philadelphia Scientific
Philadelphia Thermometer
Phillips Contr. Corp.
Pollack Corp., Joseph
Potter & Brumfield
Precision Scientific
Prec. Thermom.
Price Electric
Relay Service Co.
Roller-Smith
Sargent & Co.
Sealectric Switch & Relay
Sigma Instruments
Signal Engrg. & Mfg.
Simpson Electric
Soreng Products
Square D Co.
Sterling Engrg. Co.
Struthers-Dunn
Syncro-Start Products
Triad Transformer
Triplett Electcl. Instr.
Union Switch & Signal
U. S. Relay Co.
Walser Autom. Timer
Ward Leonard
Warrick Co.
Westinghouse Electric
Weston Electcl. Instr.
Wheelock Signals
White-Rodgers
Zenith Electric

RELAYS, Current, Including Continuous

Adams & Westlake
Advanced Electronics
Aemco Inc.
Airpax Products
Allen-Bradley
Allied Control Co.
Amer. Instr. Co.
Amer. Kloeckner-Moeller
Arrow-Hart & Hegeman
Assembly Products
Autocall Co.
Automatic Electric
Autom. Elect. Sales Corp.
Autom. Switch Co.
Autom. Temp. Contr. Co.
Bendix, Eclipse-Pioneer
Betts & Betts
Branson Corp.
Clare & Co.
Clark Controller Co.
Comar Electric
Cook Electric
Cutler-Hammer
Deltronic Corp.
Ebert Electronics
Edison, Inc., Thomas A.
Electro-Mechanical Specs.
Electronic Spec. Co.
Elgin Natl. Watch
Essex Wire Corp.
Esterline-Angus
G-V Controls
GE, Apparatus Sales
General Controls Co.
Guardian Electric
H-B Instrument
Hart Mfg. Co.
Hedin Tele Technical Corp.
Hetherington Inc.
Hi-G, Inc.
Industrial Timer Corp.
Jaidinger Mfg. Co.
Kellogg Switchboard
Kurman Electric
Leach Relay Co.
Magnecord Electric
Magnetic Amplifiers
Microloc Corp.
Milwaukee Gas
Ohmite Mfg. Co.
Paul & Stein
Perfex Corp.
Phaostron Co.
Phillips Control
Pollack Corp., Joseph
Potter & Brumfield
Price Electric
Roller-Smith
Relay Service Co.
Sealectric Switch & Relay
Signal Engrg. & Mfg.
Simpson Electric
Square D Co.
Sterling Engrg.Co.
Struthers-Dunn
Triad Transf. Corp.
Triplett Electcl. Instr.
Union Switch & Signal
U. S. Relay Co.
Ward Leonard
Westinghouse Electric
Weston Electcl. Instr.

RELAYS, Demand Totalizing

Allied Control Co.
Autocall Co.
Autom. Switch Co.
Cook Electric
Electronic Spec. Co.
Elgin Natl. Watch Co.
Engrg. & Res. Corp.
Essex Wire Corp.
GE, Apparatus Sales
Guardian Electric
Hagan Corp.
Jaidinger Mfg. Co.
Leach Relay Co.
Sangamo Electric
Triad Transf. Corp.
Westinghouse Electric

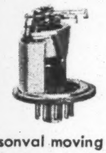
RELAYS, Electronic

Advanced Electronics
Allen-Bradley
Allied Control Co.
Amer. Electroneering
Amer. Instr. Co.
Amperite Co., Inc.
Authorized Mfrs. Service
Automatic Electric
Automatic Elect. Mfg.
Autom. Elect. Sales Corp.
Autom. Switch Co.
Autom. Temp. Contr. Co.
Avion Div.
Beck Co.
Bell & Howell
Bendix, Eclipse-Pioneer
Berkshire Labs.
Bristol Co.
Burroughs Corp.
Central Scientific
Chicago Apparatus Co.
Clark Controller Co.
Coleman Electric
Comar Electric
Computer Co. of Amer.
Continental Elect. Co.
Cook Electric
Corbett Science Labs.
Cramer Controls Corp.
Cutler-Hammer
Curtiss-Wright
Davis & Co., Inc., Dean
Deltron, Inc.
Deltronic Corp.
Detect-O-Ray Co.
De-Tec-Tronics Labs.
Devtronics, Inc.
Doelcam Div.
Dormitzer Elect. & Mfg.
Eby, Inc.
Edison, Inc., Thomas A.
Electro-Mechanical Labs.
Electro-Mechanical Specs.
Electro-Medical Lab.
Electronic Control Corp.
Electronic Devel. Lab.
Electronic Prods. Co.
Electronic Spec. Co.
Electronics Corp. of Amer.
Electro-Physics Co.
Elgin Natl. Watch
El Mec Labs.
El-Tronics, Inc.
Engrg. & Res. Corp.
Engrg. Res. & Devel.

VHS RELAY (Very High Sensitivity)

NEW: Some VHS Relays can now be built with adjustable sensitivity.

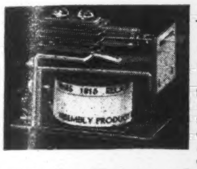
Model 266



Sample specs. are: 0.2 microamperes, (12,000 ohms coil) or, 0.1 millivolts (5 ohms.)

The VHS is a D'Arsonval moving coil relay, internally shock-mounted. The screw-on cover is gasket-sealed. Connections: 9 pin octal style. Dimensions: 1¾ diameter x 2¼ long. Weight: 4 ounces. Sensitivity: Infinite variations from 0.2 Ua to 10 Amp. or 0.1 Mv to 500 volts, self contained. Higher volts or amps with external multipliers or shunts. AC rectifier types. Trip point accuracies to 1%. Differential 1%. The degree of resistance to shock and vibration depends upon sensitivity and type of action wanted. In general, the relays will not be permanently damaged by shocks of 100G's and vibrations up to 2,000 cps at 3 to 4 G's. The most sensitive relays may close their contacts under these conditions.

Contacts: SPST or SPDT, 5-25 Ma. DC. Other ratings to ½ Amp. AC. A locking coil gives high pressure and chatter-free contact even under shock and vibration. Prices $20 to $80.



Series 1816 and 1818 Relays

Low operating current, snap action contacts, 5 amps, 125 volts (AC non-inductive) Designed for use with meter-relays. Combine high sensitivity with heavy load capacity. SPDT or DPDT. Also available in plug-in cans. Prices $6 to $14.50

Write for 40 page catalog 4B.

Assembly Products, Inc., Chesterland 30, Ohio. Phone: (Cleveland, O.) HAmilton 3-4436 (West Coast: Desert Hot Springs 30, Calif. Phone: 4-3133 & 4-2453).

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Erdco Engrg. Co.
Ess Instr. Co.
Essex Wire Corp.
Excel Elect. Service Co.
Farmer Elect. Prods.
Farnsworth Electronics
Ferrara Inc.
Fisher-Pierce
Fisher Scientific
General Controls Co.
GE, Apparatus Sales
Gorrell & Gorrell
Guardian Elect. Mfg.
H-B Instr. Co.
Haledy Electronic Co.
Hart Mfg. Co.
Harvey Radio Labs.
Hedin Tele Technical Corp.
Hi-G, Inc.
Hufco Industries
Indust. Electronic Conts.
Industrial Electronics
Industro, Inc.
Instruments Inc.
Internat. Business Machs.
Internat. Instr. Co.
Jarco Services
Jarvis Electronics
Johanson Mfg. Co.
Johnson Co., E. F.
Kahn & Co.
Kellogg Switchboard
Kinetic Instrument
Kurman Electric
L.A.B. Corp.
Labline, Inc.
Leach Relay Co.
Liquidometer Corp.
Lumenite Electronic
Lyman Electronic
Mack Electric Devices
Magnecord Electric
Manning, Maxwell & Moore
Metron Instrument
Milwaukee Gas
Minneapolis-Honeywell
Mullenbach Elect. Mfg.
Neomatic, Inc.
Opad Electric
Peschel Electronics
Phaostron Co.
Philadelphia Scientific
Phillips Control
Phipps & Bird
Pollak Corp., Joseph
Post Machinery Co.
Potter & Brumfield
Precision Scientific
Prec. Therm. & Insts.
Price Electric
Process & Instruments
RCA Div.
Raytheon Mfg.
Rea Co., J. B.
Relay Service Co.
Research Appliance Co.
Revere Corp. of Amer.
Rockwell Engrg. Co.
Sargent & Co.
Servo-Tek Products
Sigma Instruments
Signal Engrg. & Mfg.
Simpson Electric
Square D Co.
Standard Electrical Prods.
Struthers-Dunn
Sweets Co., Martin
Sylvania Elect. Prods.
Technical Equipt. Co.
Televiso Products
Thordarson-Meissner
Triad Transf. Corp.
Union Switch & Signal
U. S. Relay Co.
Vacuum Tube Prods.
Varo Mfg.Co.
Virginia Electronics
Walkirt Co.
Weston Electcl. Instr.
Wilkins-Anderson
Wilson & Co., G. C.
Worner Electronic Devices

RELAYS, Frequency

Autocall Co.
Automatic Switch Co.
Bendix, Eclipse-Pioneer
Biddle Co., James G.
Control Corp.
Cook Electric
Deltronic Corp.
Electronic Spec. Co.
Elgin Natl. Watch
Engrg. & Res. Corp.
Esterline-Angus
G-V Controls
GE, Apparatus Sales
Guardian Electric
Hickok Electcl. Instr.
Helipot Div.
Internat. Business Machs
James Vibrapowr Co.
Kellogg Switchboard
Leach Relay Co.
Lumenite Electronic
Phaostron Co.
Potter & Brumfield
Sigma Instruments
Stevens-Arnold, Inc.
Tri-Tronics Co.
Triad Transf. Corp.
U. S. Relay Co.
Varo Mfg. Co., Inc.
Wallace & Tiernan
Ward Leonard
Westinghouse Electric

RELAYS, Galvanometer

Allied Control Co.
Assembly Products
Autocall Co.
Autom. Temp. Contr. Co.
Doelcam Div.
Eby, Inc., Hugh H.
Edison, Inc., Thomas A.
Engrg. & Res. Corp.
Esterline-Angus
GE, Apparatus Sales
Larson Instr. Co.
Leach Relay Co.
Marion Electcl. Instr.
Potter & Brumfield
Roller-Smith
Rubicon Co.
Triad Transf. Corp.
Varo Mfg. Co.
Westinghouse Electric

RELAYS, Heavy Duty (rating 30 amp. or above)

Adams & Westlake
Allen-Bradley
Amer. Kloeckner-Moeller
Autom. Switch Co.
Cook Electric
Cutler-Hammer
Durakool, Inc.
Ebert Electronics
Elgin Natl. Watch Co.
Furnas Electric
GE, Apparatus Sales
Gordos Corp.
Guardian Elect. Mfg. Co.
H-B Instr. Co.
Hetherington, Inc.
Jennings Radio Mfg. Corp.
Johnson Co., E. F.
Kurman Electric
Leach Relay Co.
Mack Electric Devices
Phaostron Co.
Pollak Corp., Joseph
Potter & Brumfield
Price Electric
Struthers-Dunn
U. S. Relay Co.
Ward Leonard
Westinghouse Electric
Wheelock Signals, Inc.
Zenith Electric

RELAYS, Instrument Controlled

Abrams Instr. Co.
Adams & Westlake
Advanced Electronics
Aemco Inc.
Allied Control Co.
Amer. Instr. Co.
Amer. Kloeckner-Moeller
Amperite Co., Inc.
Assembly Products
Autocall Co.
Automatic Elect. Mfg.
Autom. Elect. Sales Corp.
Autom. Switch Co.
Autom. Temp. Contr. Co.
Bailey Meter Co.
Barber-Colman
Beck Co.
Bendix, Eclipse-Pioneer
Bendix-Friez
Bristol Co.
Branson Corp.
Climax Div.
Comar Electric
Conoflow Corp.
Cook Electric
Cramer Controls Corp.
Deltronic Corp.
Devtronics Inc.
Edison Inc., Thomas A.
Electric Des. & Mfg.
Electronic Specialty Co.
Elgin Natl. Watch
General Controls Co.
GE, Apparatus Sales
Guardian Elect. Mfg. Co.
H-B Instr. Co.
Haledy Electronic Co.
Hedin Tele Technical
Instruments Inc.
Jaidinger Mfg. Co.
Larson Instr. Co.
Leach Relay Co.
Luther Mfg. Co.
Mack Electric Devices
Magnecord Electric
Manning, Maxwell & Moore
Marion Electcl. Instr.
Milwaukee Gas
Minneapolis-Honeywell
Moore Products
Perfex Corp.
Phaostron Co.
Philadelphia Scientific
Philadelphia Thermom. Co.
Phillips Controls
Pollak Corp., Joseph
Potter & Brumfield
Precision Scientific
Precision Scientific
Prec. Therm. & Insts.
Relay Service Co.
Roller-Smith
Scam Instr. Corp.
Sealectric Switch & Relay
Sigma Instruments
Signal Engrg. & Mfg.
Simpson Electric
Struthers-Dunn
Taylor Instr. Cos.
Technical Equipt. Corp.
Tork Clock
Triad Transf. Corp.
Triplett Electcl. Instr.
Union Switch Signal
U. S. Relay Co.
Ward Leonard
Weston Electcl. Instr.

RELAYS, Latching, see Relays, Stepping

RELAYS, Light Sensitive, see Relays, Photoelectric

RELAYS, Magnetic, see Relays, Electromagnetic

RELAYS, Mercury (see also Switches, Mercury)

Adams & Westlake
Allied Control Co.
Amer. Instr. Co.
Autocall Co.
Autom. Elect. Sales Corp.
Autom. Temp. Contr. Co.
Chatham Electronics
Clare & Co., C. P.
Continental Elect. Co.
Deltron, Inc.
Durakool, Inc.
Ebert Electronics
Electronic Apparatus
Gordos Corp.
H-B Instr. Co.
Haledy Electronics
Mack Electric Devices
Mercury Contacts, Inc.
Minneapolis-Honeywell
Philadelphia Scientific
Precision Scientific
Prec. Thermom. & Insts.
Scientific Glass App.
Struthers-Dunn

RELAYS, Mercury Tube

Adams & Westlake
Allied Control Co.
Amer. Instr. Co.
Autocall Co.
Autom. Elect. Sales Corp.
Autom. Temp. Contr. Co.
Chatham Electronics
Clare & Co., C. P.
Durakool, Inc.
Ebert Electronics
G-M Labs.
General Controls Co.
Gordos Corp.
H-B Instr. Co.
Haledy Electronics
Kellogg Switchboard
Mack Electric Devices
Mercoid Corp.
Mercury Contacts, Inc.
Minneapolis-Honeywell
Philadelphia Scientific
Philadelphia Thermom. Co.
Precision Scientific
Prec. Thermom. & Insts.
Struthers-Dunn
Ward Leonard

RELAYS, Motor Driven, Time Delay

Abrams Instr. Corp.
Aemco, Inc.
Allen-Bradley
Amer. Instr. Co.
Amperite Co., Inc.
Automatic Elect. Mfg.
Autom. Switch Co.
Autom. Temp. Contr. Co.
Barber-Colman
Bendix-Friez
Betts & Betts
Bristol Motor Div.
Clarostat Mfg. Co.
Control Engrg. Co.
Controls, Inc.
Cook Electric
Cramer Controls Corp.
Cutler-Hammer
Eagle Signal Corp.
Electronic Spec. Co.
Elgin Natl. Watch
General Controls Co.
GE
Guardian Elect. Mfg. Co.
Hagen Mfg. Co.
Haydon Co., A. W.
Haydon Mfg. Co.
Henschel Corp.
Industrial Engrg. Corp.
Industrial Timer Corp.
Kurman Electric
Leach Relay Co.
Lumenite Electronics
Minneapolis-Honeywell
Paragon Electric
Philadelphia Scientific
Potter & Brumfield
Price Electric
Sealectric Switch & Relay
Square D Co.
Struthers-Dunn
Wallace & Tiernan
Ward Leonard
Westinghouse Electric
Weston Electcl. Instr.
Zenith Electric

RELAYS, Movable Coil, A C

Allen-Bradley
Amer. Kloeckner-Moeller
Assembly Products
Automatic Elect. Mfg.
Autom. Switch Co.
Cook Electric
Cutler-Hammer
Electro-Tech. Equipt.
Esterline-Angus
Kurman Electric
GE, Apparatus Sales
Guardian Elect. Mfg. Co.
Larson Instr. Co.
Potter & Brumfield
Roller-Smith Co.
Simpson Electric
Struthers-Dunn
Triplett Electcl. Instr.
Union Switch
Westinghouse Electric
Weston Electcl. Instr.

RELAYS, Overload

Adams & Westlake
Allen-Bradley
Allied Control Co.
Amer. Kloeckner-Moeller
Amperite Co., Inc.
Assembly Products
Autocall Co.
Automatic Elect. Mfg.
Autom. Switch Co.
Autom. Temp. Contr. Co.

Special and Standard

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Accurate, Dependable, Long Life

Nearly 50 years of experience in specialized design and production of precision components . . . .

RELAYS

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COMMUNICATIONS
COMPUTER, POWER CIRCUIT
HIGH VOLTAGE
MINIATURE
MINIATURE HERMETICALLY SEALED
PULSE

SOLENOIDS

MINIATURE
PLUNGERS FOR PUSH OR PULL
300 CUSTOM TYPES FROM 20 STANDARD PARTS
DOUBLE ACTING

SWITCHES

IMPULSE
MOMENTARY
PUSH PULL
ROTARY SELECTOR
TOGGLE

OUR ENGINEERS CAN HELP SOLVE YOUR PROBLEMS

Take advantage of POLLAK free engineering design service. Our factory-trained engineers are available to help you solve difficult relay, switching and electrical control problems.

WE INVITE YOUR INQUIRY

JOSEPH POLLAK CORPORATION

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75-95 Freeport Street
Boston 22, Mass.

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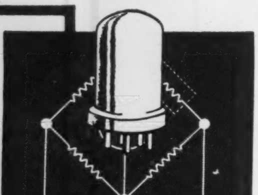

Null Detector Relay

SOLVES MANY TEMPERATURE CONTROL PROBLEMS

An Edison Sensitive D. C. Relay and an ordinary bridge circuit are versatile tools in solving temperature control problems.

In the bridge shown assume the dotted resistor to be a resistance temperature detector and the other resistors adjusted so that the bridge will reverse current flow through the relay at a given temperature. The polarized relay will sense the reverse current flow to close (or open) its contacts at the null point.

This circuit is useful in temperature warning systems since the relay automatically reopens when the current reverses again—to actuate an "all clear" signal.

The Edison Relay is reliable at values from 30 microamperes to 12 milliamperes. Overloads to 10,000 X coil input power are absorbed without damage. Contacts are rated at ⅓ ampere at 28 volts d.c. in SPST or SPDT arrangement.

For full information send for free bulletin, No. 3037.

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Bunnell & Co.
Burlington Instr. Corp.
Clark Controller Co.
Comar Electric
Cook Electric
Cutler-Hammer
E-T-A Products
Edison, Inc., Thomas A.
Edison, Instr. Div.
Electro-Mechanical Specs.
Electronic Control Corp.
Electronic Specialty Co.
Elgin Natl. Watch
Furnas Electric
G-V Controls, Inc.
GE, Apparatus Sales
Guardian Elect. Mfg. Co.
Jaidinger Mfg. Co.
Jennings Radio Mfg. Corp.
Kurman Electric
Larson Instr. Co.
Leach Relay Co.
Magnecord Electric
Milwaukee Gas Spec. Co.
Monitor Controller Co.
Neomatic, Inc.
Ohmite Mfg. Co.
Perfex Corp.
Phaostron Co.
Pollak Corp.
Potter & Brumfield
Price Electric
Roller-Smith
Sealectric Switch Relay
Sigma Instruments
Simpson Electric
Square D Co.
Standard Electcl. Prods.
Sterling Engrg. Co.
Struther-Dunn
Sweets Co., Martin
U. S. Relay Co.
Ward Leonard
Westinghouse Electric
Weston Electcl. Instr.

RELAYS, Permanent-Magnet Movable Coil (D'Arsonval Type)

Amer. Kloeckner-Moeller
Assembly Products
Bunnell & Co., J. H.
Cook Electric
Electric Des. & Mfg.
Esterline-Angus
GE, Apparatus Sales
Kurman Electric
Larson Instr. Co.
Leach Relay Co.
Marion Electcl. Instr.
Roller-Smith
Rudolph & Sons, O. C.
Simpson Electric
Signal Engrg. & Mfg.
Triplett Electcl. Instr. Co.
Westinghouse Electric
Weston Electcl. Instr.

RELAYS, Photoelectric

Allied Control Co.
Amer. Instr. Co.
Automatic Electric
Autom. Elect. Sales Corp.
Autom. Temp. Contr. Co.
Autotron Co.
Autron Engrg., Inc.
Avion Div.
Comar Electric
Continental Electric
Cutler-Hammer
Deltron, Inc.
Detect-O-Ray
De-Tec-Tronic Corp.
Dickson Co.
Eby, Inc.
Edison, Thomas A.
Electro-Mechanical Insts.
Electro-Physics Co.
Electronic Control Corp.
Electronic Dev. Lab.
Electronic Prods. Co.
Electronics Corp. of Amer.
Elgin Natl. Watch
El-Tronics, Inc.
Engrg. Res. & Devel.
Ess Instr. Co.
Farmer Electr. Prods. Co.
Fisher-Pierce
G-M Labs., Inc.
General Controls Co.
GE, Apparatus Sales
Gorrell & Gorrell
Guardian Elect. Mfg. Co.
Haledy Electronics
Hetherington, Inc.
Hunter Mfg. Co.
Indust. Electronic Conts.
Kurman Electric
Larson Instr. Co.
Leach Relay Co.
Lewyt Corp.
Lumenite Electronics
Milwaukee Gas Spec. Co.
Minneapolis-Honeywell
Neomatic, Inc.
Phaostron Co.
Phillips Control
Phipps & Bird
Phoenix Prec. Instr.
Potter & Brumfield
Potter Instr. Co.
Prec. Thermom.
Relay Service Co.
Ripley Co.
Rockwell Engrg. Co.
Rubicon Co.
Sigma Instruments
Struthers-Dunn
Triplett Electcl. Instr.
Tri-Tronics Co.
Ward Leonard
Westinghouse Electric
Weston Electcl. Instr.
Worner Electronic Devices

RELAYS, Pneumatic

AiResearch Mfg. Co.
Allen-Bradley
Bailey Meter Co.
Bellofram Corp.
Black, Sivalls & Bryson
Bristol Co.
Conoflow Corp.
Cutler-Hammer
Dahl Co., Inc., George W.
Eagle Signal Corp.
Fisher Governor
Foxboro Co.
Hagan Corp.
Johnson Service Co.
Kendall Controls Corp.
Mead Specialties Co.
Minneapolis-Honeywell
Moore Products
Phaostron Co.
Powers Reg. Co.
Research Controls
Taylor Instr. Cos.
Westinghouse Air Brake
Westinghouse Electric

RELAYS, Polarized

Airpax Prod.
Allied Control Co.
Assembly Products
Autocall Co.
Automatic Electric
Automatic Elect. Mfg.
Autom. Elect. Sales Corp.
Autom. Switch Co.
Babcock Relays
Barber-Colman
Bendix, Eclipse-Pioneer
Bristol Co.
Bunnell & Co.
Clare & Co., C. P.
Clark Controller Co.
Cook Electric
Edison Inc., Thomas A.
Electro-Mechanical Inst.
Elgin Natl. Watch
GE, Apparatus Sales
Hart Mfg. Co.
Hetherington, Inc.
Jaidinger Mfg. Co.
Kurman Electric
L.A.B. Corp.
Larson Instr. Co.
Leach Relay Co.
Luther Mfg. Co.
Magnecord Electric
Marion Electcl. Instr.
Matisa Equipt. Corp.
Maxson Corp.
Neomatic, Inc.
North Electric
Phaostron Co.
Pollak Corp., Joseph
Potter & Brumfield
Prec. Thermon & Insts.
Raytheon Mfg.
Sealectric Switch & Relay
Sigma Instruments
Signal Engrg. & Mfg.
Stevens-Arnold, Inc.
Struthers-Dunn
Triplett Electcl. Instr.
Westinghouse Electric
Weston Electcl. Instr.
Wheelock Signals

RELAYS, Power

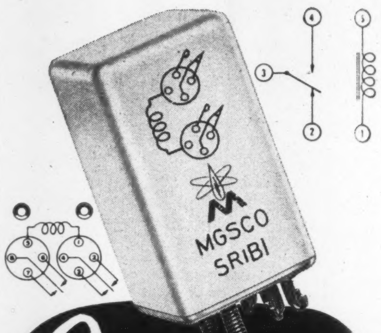
Adams & Westlake
Aemco Inc.
Allen-Bradley
Allied Control Co.
Amer. Instr. Co.
Amer. Kloeckner-Moeller
Automatic Electric
Automatic Elect. Mfg.
Autom. Switch Co.
Bendix, Eclipse-Pioneer
Branson Corp.
Clare & Co., C. P.
Clark Controller Co.
Comar Electric
Cook Electric
Cutler-Hammer
Detect-O-Ray
Ebert Electronics
Electro-Mechanical Specs.
Electronic Spec. Co.
Elgin Natl. Watch
Esterline-Angus
General Controls Co.
GE, Apparatus Sales
Grayhill
Guardian Elect. Mfg. Co.
H-B Instr. Co.
Hagan Corp.
Hetherington, Inc.
Hi-G, Inc.
Hufco Industries
Jennings Radio
Johnson Co., E. F.
Kurman Electric
Leach Relay Co.
Mack Electric Devices
North Electric
Ohmite Mfg. Co.
Perfex Corp.
Phaostron Co.
Philadelphia Scientific
Phillips Control
Pollak Corp., Joseph
Potter & Brumfield
Price Electric
Roller-Smith
Sealectric Switch & Relay
Sigma Instruments
Signal Engrg. & Mfg.
Square D Co.
Sterling Engrg. Co.
Struthers-Dunn
Swartwout Co.
U. S. Relay Co.
Ward Leonard
Warrick Co., Charles F.
Westinghouse Electric
Weston Electcl. Instr.
Wheelock Signals

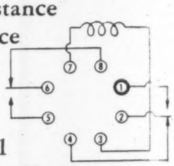
RELAYS, Sensitive

Adams & Westlake
Aemco Inc.
Amer. Instr. Co.
Assembly Products
Automatic Electric
Autom. Elect. Sales Corp.
Autom. Switch Co.
Babcock Relays
Bristol Co.
Clare & Co., C. P.
Comar Electric
Cook Electric
Ebert Electronics
Edison, Inc., Thomas A.
Electro-Mechanical Spec.
Electronic Specialty Co.
Electronics Corp. of Amer.
Electrosonic Engrg. Co.
Elgin Natl. Watch
General Controls Co.
GE, Apparatus Sales
Guaradian Elect. Mfg. Co.
H-B Instr. Co.
Hart Mfg. Co.
Haydon Co., A. W.
Hedin Tele Technical Corp.
Hetherington Inc.
Kurman Electric
Larson Instr. Co.
Leach Relay Co.
Liquidometer Corp.
Luther Mfg. Co.
Mack Electric Device
Milwaukee Gas Spec. Co.
Mullenbach Div.
Mutual Industries
Neomatic, Inc.
North Electric
Ohmite Mfg. Co.
Phaostron Co.
Phillips Control Corp.
Potter & Brumfield
Price Electric
Process & Instruments
Relay Service Co.
Research Appliance Co.
Revere Corp. of Amer.
Sealectric Switch & Relay
Sigma Instruments
Simpson Electric
Std. Electrical Prods.
Struthers-Dunn
U. S. Instr. Corp.
U. S. Relay Co.
Ward Leonard
Westinghouse Electric
Weston Electcl. Instr.
Wheelock Signals
Winslow Co., Inc.

RELAYS, Stepping

Allied Control Co.
Autocall Co.
Automatic Electric
Automatic Elect. Mfg.
Autom. Elect. Sales Co.
Clare & Co., C. P.
Collins Radio Co.
Control Engrg. Co.
Cook Electric





HERMETICALLY SEALED
Sensitive RELAYS

TESTED 100% FOR

- ★ Contact Resistance
- ★ Coil Resistance
- ★ Dielectric
- ★ Vibration
- ★ Dimensions
- ★ Hermetic Seal
- ★ Operating Specifications at Hot, Cold, and Room Temperature

TO MEET THESE SPECIFICATIONS

- ★ Contact Resistance
  .030 ohm max.
- ★ Coil Resistance
  Max.—20,000 ohms
- ★ Sensitivity
  Max.—2.5 mw.
- ★ Dielectric Strength
  500 v., a.c.
- ★ Vibration
  10 G's or better to 55 c.p.s.
- ★ Sealing
  Hermetic seal with nitrogen fill
- ★ Temperature Operating and Shelf
  −65° C. to 125° C.
- ★ Size
  1'' sq. x 1$\frac{25}{32}$'' from mounting surface

Write for Bulletin

MILWAUKEE GAS SPECIALTY CO.
Dept. ID, Milwaukee 1, Wisconsin

For more information circle **315** on inquiry card.

Corbett Science Labs.
Daystrom Inst.
Electronic Spec. Co.
Federal Telephone & Radio
GE, Apparatus Sales
Guardian Elec. Mfg. Co.
Hetherington, Inc.
Kellogg Switchboard
Leach Relay Co.
Leland, Inc., G. H.
Lumenite Electronics
Neomatic, Inc.
North Electric
Oak Mfg. Co.
Phaostron Co.
Phillips Control Corp.
Potter & Brumfield
Price Electric
Roller-Smith
Sealectric Switch & Relay
Square D Co.
Std. Electrical Prods.
Sterling Engrg. Co.
Struthers-Dunn
Union Switch & Signal
U. S. Instr. Corp.
Westinghouse Electric

RELAYS, Subminiature

Aemco Inc.
Amperite Co., Inc.
Babcock Relays
Bristol Co.
Clare & Co., C. P.
Cook Electric
Deltronic Corp.
Electro-Mechanical Specs.
Electronic Spec. Co.
Electronic Engrg. Co.
Elgin Natl. Watch
Filtors, Inc.
GE, Apparatus Sales
Guardian Elect. Mfg.
Hart Mfg. Co.
Hetherington Inc.
Hufco Industries
Kurman Electric
Leach Relay Co.
Luther Mfg. Co.
Milwaukee Gas Spec. Co.
Mutual Industries
Neomatic, Inc.
North Electric Mfg.
Phaostron Co.
Phillips Control Corp.
Pollak Corp., Joseph
Potter & Brumfield
Price Electric
Relay Service Co.
Revere Corp. of Amer.
Std. Electrical Prods.
Struthers-Dunn
U. S. Relay Co.
Winslow Co., Inc.

RELAYS, Telephone, Auxiliary Ringing

Allied Control Co.
Amer. Relay
Autocall Co.
Automatic Electric
Autom. Elect. Sales Corp.
Clare & Co., C. P.
Comar Electric
Cook Electric
Electronic Spec. Co.
Elgin Natl. Watch
Federal Telephone & Radio
Guardian Elect. Mfg.
Henschel Corp.
Hufco Industries
Kellogg Switchboard
Kurman Electric
Leach Relay Co.
Magnecord Electric
Mutual Industries
North Electric Mfg.
Ohmite Mfg. Co.
Phillips Control
Potter & Brumfield
Price Electric
Sealectric Switch & Relay
Sigma Instruments
Signal Engrg. & Mfg.
Std. Electrical Prods.
Sterling Engrg. Co.
Struthers-Dunn
U. S. Instr. Corp.
U. S. Relay Co.
Wheelock Signals

RELAYS, Temperature

Allen-Bradley
Assembly Products
Autocall Co.
Autom. Temp. Contr. Co.
Bar-Ray Products
Bendix-Friez
Bristol Co.
Cook Electric
Cutler-Hammer
Electronic Spec. Co.
Elgin Natl. Watch
Fielden Instr. Div.
G-M Laboratories
G-V Controls
General Controls
GE, Apparatus Sales
Gleason-Avery
H-B Instr. Co.
Jaidinger Mfg. Co.
Kybernetes Corp.
Larson Instr. Co.
Leach Relay Co.
Lewis Engrg. Co.
Magnetic Research Corp.
Minneapolis-Honeywell
Perfex Div.
Potter & Brumfield
Powers Reg. Co.
Process & Instruments
Square D Co.
[illegible] Products
Struthers-Dunn, Inc.
Triplett Electcl. Instr.
Ulanet Co.
Westinghouse Electric
Weston Electcl. Instr. Corp.

RELAYS, Temperature-compensated

Airpax Products
Assembly Products
Autom. Elect. Sales Corp.
Betts & Betts
Branson Corp.
Bristol Co.
Edison, Inc., Thomas
Electronic Spec. Co.
Elgin Natl. Watch
Fielden Instr. Div
Fuel Watchman
G-V Controls, Inc.
GE, Apparatus Sales
Hart Mfg. Co.
Hetherington Inc.
Jaidinger Mfg. Co.
Larson Instr. Co.
Leach Relay Co.
Milwaukee Gas
Minneapolis-Honeywell
Neomatic, Inc.
Phaostron Co.
Pollak Corp., Joseph
Sigma Instruments
Struthers-Dunn
U. S. Relay Co.
Wallace & Tiernan
Westinghouse Electric

RELAYS, Time Delay

A'G'A Div.
Abrams Instr. Corp.
Adams & Westlake
Advance Elect. & Relay Co.
Aemco Inc.
Allegany Instr. Co.
Allen-Bradley
Amer. Gas Accumulator
Amer. Instr. Co.
Amperite Co.
Autocall Co.
Autom. Electric Co.
Autom. Elect. Mfg. Co.
Autom. Elect. Sales Corp.
Autom. Switch Co.
Autom. Temp. Control
Barber-Colman
Betts & Betts
Borel & Co.
Branson Corp.
Bristol Co.
Clare & Co.
Clark Controller Co.
Clarostat Mfg. Co.
Comar Electric
Control Engrg. Co.
Cook Electric
Cramer Controls Corp.
Curtiss-Wright
Cutler-Hammer
Dormitzer Elect. & Mfg.
Durakool, Inc.
E-T-A Products
Eagle Signal
Ebert Electronics
Edison Inc., Thomas A.
Elastic Stop Nut
Electronic Prods. Co.
Electronic Spec. Co.
Electronics Corp. of Amer.
Elgin Natl. Watch
Ferrara, Inc.
Fisher-Pierce
G-V Controls, Inc.
General Controls Co.
GE, Apparatus Sales
Gordos Corp.
Guardian Elect. Mfg. Co.
Haledy Electronics Co.
Haydon Co., A.W.
Haydon Mfg. Co.
Heinmann Elect. Co.
Hetherington, Inc.
Industrial Engrg. Corp.
Industrial Timer Corp.
Internat. Business Machs.
Jaidinger Mfg. Co.
Jarvis Electronics
Kellogg Switchboard
Kurman Electric
Leach Relay Co.
Lumenite Electronics
Meletron Corp.
Metals & Controls Corp.
Minneapolis-Honeywell
Mutual Industries
National Time & Signal
Neomatic, Inc.
North Electric
Ohmite Mfg. Co.
Paragon Electric
Partlow Corp.
Perfex Corp.
Phaostron Co.
Phillips Control Corp.
Photoswitch Div.
Pollak Corp., Joseph
Potter & Brumfield
Price Electric
Raytheon Mfg. Co.
Schrader's Son, A.
Spencer Thermostat Div.
Std. Electrical Prods.
Struthers-Dunn
Ulanet Co.
U. S. Relay Co.
Vocaline Co. of Amer.
Ward Leonard
Westinghouse Electric
Wilson & Co., G. C.
Worner Electronic Devices
Zenith Electric Co.

RELAYS, Transformer, Low Voltage

Advance Elect. & Relay Co.
Allen-Bradley
Allied Control Co.
Auth Elect. Specialties
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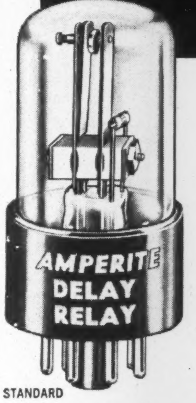
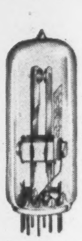
Autom. Switch Co.
B.W. Controller Corp.
Barber-Colman
Bendix-Friez
Comar Electric
Control Engrg. Co.
Cook Electric

True Hermetic Sealing assures Maximum Stability in AMPERITE RELAYS and REGULATORS

Simplest • Most Compact • Most Economical



STANDARD


MINIATURE

Thermostatic DELAY RELAYS

2 to 180 Seconds

- Actuated by a heater, they operate on A.C., D.C., or Pulsating Current.
- *Hermetically sealed.* Not affected by altitude, moisture, or other climate changes.
- *SPST only* — normally open or normally closed.

Amperite Thermostatic Delay Relays are compensated for ambient temperature changes from —55° to +70° C. Heaters consume approximately 2 W. and may be operated continuously. The units are *most compact, rugged, explosion-proof, long-lived,* and — *inexpensive!*

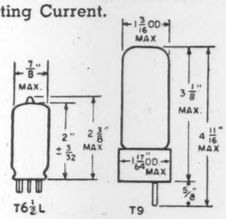
TYPES: Standard Radio Octal, and 9-Pin Miniature

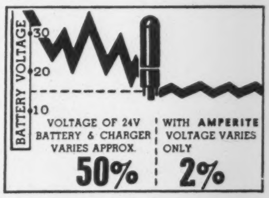
PROBLEM? Send for Bulletin No. TR-81

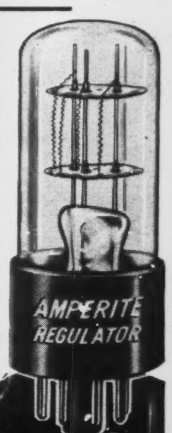
Also — **Amperite Differential Relays:** Used for *automatic overload, under-voltage or under-current protection.*

BALLAST REGULATORS

Amperite Regulators are designed to keep the current in a circuit ***automatically regulated*** at a definite value (for example, 0.5 amp.) ... For currents of 60 ma. to 5 amps. Operate on A.C., D.C., Pulsating Current.







T9 BULB

Hermetically sealed, they are not affected by changes in altitude, ambient temperature (—55° to +90° C.), or humidity ... Rugged, light, compact, most inexpensive.

Write for 4-page Technical Bulletin No. AB-51

AMPERITE CO., Inc.
561 Broadway, New York 12, N. Y.
Telephone: CAnal 6-1446
In Canada: Atlas Radio Corp., Ltd.
50 Wingold Ave., Toronto 10

Individual inspection and double-checking assures top quality of Amperite Products.

For more information circle **316** on inquiry card.

World's Smallest*

Mercury Plunger-Type Relay

EBERT'S NEW MINIRELAY

Proven in Use For All Loads Up to 20 Amps

Hermetically Sealed Explosion-Proof! No Sparks!

Millions of Trouble-Free "Makes & Breaks"

Forget it once it's Installed!

Competitively Low Priced

35 Millisecond Fast Action!

Installs in one minute!

*3-1/2" H x 1-3/4" W x 1-1/2" D

20 AMPS/115 V. AC • 10 AMPS/230 V. AC • 6.5 AMPS/120 V. DC • 3.5 AMPS/220 V. DC • 1.5 Hp./115, 230 or 440 V. AC • 1/3 Hp./120 and 220 V. DC

Available normally open or normally closed, SPST

FREE fact file-Write today

EBERT ELECTRONICS CORP.

212-60 Jamaica Ave., Queens Village 28, N. Y.

For more information circle 317 on inquiry card.

Mack

TOP LEVEL QUALITY

MERCURY PLUNGER RELAYS

• Only One Moving Part

• No Exposed Arc

• Silent

• U.L. Listed

•

Ask for information on the new, silent, CA series for use where greater ruggedness is required. Other Mack relays are available normally closed or normally open for use with contact equipped instruments.

Mack ELECTRIC DEVICES, INC.

38 GLENSIDE AVE.

WYNCOTE, PA.

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GE, Apparatus Sales
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Internat. Std. Trading
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Leach Relay Co.
Lumenite Electronics
Magnecord Electric
Mercoid Corp.
Minneapolis-Honeywell
Partlow Corp.
Perfex Corp.
Raytheon Mfg. Co.
Sealectric Switch & Relay
Sigma Instruments
Soreng Products
Square D Co.
Struthers-Dunn
Thordarson Elect. Mfg.
Union Switch & Signal
U. S. Relay Co.
Ward Leonard
Warrick Co.
Westinghouse Electric
White-Rodgers

RELAYS, Vacuum Contact

Aemco Inc.
Amer. Instr. Co.
Bristol Co.
Chatham Electronics
Clare & Co., C. P.
Ebert Electronics
Edison, Inc., Thomas A.
Eitel-McCullough
Electro-Mechanical Instr.
Elgin Natl. Watch
GE
H-B Instr. Co.
Jennings Radio Mfg. Corp.
Lumenite Electronics
Mack Electric Devices
Pollak Corp., Joseph
Rockwell Engrg. Co.
Struthers-Dunn

RELAYS, Vacuum Tube, see Relays, Electronic

RELAYS, Vibrating Reed Type

Automatic Electric
Autom. Elect. Sales Corp.
Biddle Co., James G.
Bristol Co.
Hetherington, Inc.
Mutual Electronic
  Industries
Neomatic, Inc.
North Electric
Potter & Brumfield
Stevens-Arnold
Westinghouse Electric
Winslow Co.

RELIEF VALVES, see Valves, Relief

REMOTE-CONTROL EQUIPMENT, see Telemetering

REMOTE-HANDLING DEVICES

Autom. Control Co.
Autom. Switch Co.
Bendix-Pacific
Femco, Inc.
GE, Apparatus Sales
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Genzlinger, Inc.
Jamesbury Corp.
Metrotype Corp.
NRD Instr. Co.
Nuclear Corp. of Amer.
Panellit, Inc.
R.K.L. Valve & Mfg. Co.
Research Controls
Scientific Specialties
Shand & Jurs
Superdraulic Corp.
Taller & Cooper
Universal Atomics Corp.

REMOTE-METERING EQUIPMENT, Electrical, see Telemetering

REMOTE-METERING EQUIPMENT, Pneumatic, see Pressure Differential Transmitters

RESISTANCE BOXES, including Decade, Dividing, etc.

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Beckshire Labs.
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Clarke Instr. Corp.
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Central Scientific
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Cornell-Dubilier
Cutler-Hammer
Daven Co.
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Feiler Engrg. Co.
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Gray Instr. Co.
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Kearfott (Western)
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Mallory & Co., P. R.
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Measurements Corp.
Muter Co.
Ohmite Mfg. Co.
Pimex, Inc.
Potter Instr. Co.
Precise Devel. Corp.
Radio City Products
RCA Div.
Reiner Electronics
Rubicon Co.
Sensitive Res. Instr.
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Std. Science Supply
Televiso Co.
Telex, Inc.
Thordarson-Meissner
Thwing-Albert
Triumph Mfg. Co.
Ward Leonard
Welch Mfg. Co., W. M.

RESISTANCE COMPARATORS

ACF Electronics
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Barnes Devel. Co.
Bogue Electric Mfg. Co.
Borden Engrg. Div.
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Brunswick Instruments
Brush Electronics
Cal-Tronics Corp.
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Electronic Instr. Co.
Federal Products
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Freed Transf. Co.
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Indust. Test Equipt. Co.
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Pacific Scientific
Phaostron Co.
Physics Research Labs.
Radio Corp. of Amer.
Rubicon Co.
Scott, Inc., Hermon H.
Sensitive Res. Instr.
Simpson Electric
Shallcross Mfg. Co.
Southw. Indust. Electron.
Thordardson-Meissner
United Optical Mfg.

RESISTANCE INDICATORS, Ground

Air-O-Tronics
Amer. Instr. Co.
Associated Research
Automatic Electric
Autom. Elect. Sales Corp.
Berkeley Div.
Biddle Co., Jas. G.
Borden Engrg. Div.
GE, Instrument Dept.
General Electronic
Geophysical Instrument
Georator Corp.
Gray Instr. Co.
Heiland Div.
Industrial Insts., Inc.
Leeds & Northrup
Miller, M. C.
Rawson Electcl. Instr.
Roller-Smith
Rubicon Co.
Sensitive Res. Instr.
Shallcross Mfg. Co.
Sticht Co., Herman H.

RESISTANCE INDICATORS, Insulation (see also Insulation Testers)

American Tradair Corp.
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Dice Co., J. W.
Federal Telephone & Radio
Freed Transformer
GE, Apparatus Sales
Industrial Instrs., Inc.
Keithley Insts., Inc.
Leeds & Northrup
Martindale Elect. Co.
Peschel Electronics
Precise Measmts. Co.
Shallcross Mfg. Co.
Sticht Co., Herman H.

RESISTANCE INDICATORS, Megohm

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American Paulin
Amer. Tradair Corp.
Associated Research
Bendix-Cincinnati
Biddle Co., James G.
Brush Electronics
California Magnetic
Cambridge Instr. Co.
Chicago Indust. Instr.
Clippard Instr. Lab.
Clough-Brengle
Dice Co., J. W.
Dit-Mco, Inc.
Electro Instr., Inc.
Electronic Devel. Lab.
Electro-Mec Lab.
Electro Prods. Lab.
Electro-Tech Equipt.
El-Tronics Inc.
Federal Telephone & Radio
Feiler Engrg. Co.
Freed Transformer
GE
GE, Apparatus Sales
General Radio Co.
Hermetic Sealing Corp.
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Keithley Insts., Inc.
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MacLeod & Hanopol
Martindale Electric
Measurements Corp.
Meters, Inc.
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Phaostron Co.
Physics Research
Pimex, Inc.
Precise Measurements Co.
Precision Apparatus
Radio City Products
Rawson Electcl. Instr.
Reiner Electronics
Scientific Specialties
Sensitive Res. Instr.
Shallcross Mfg. Co.
Sherron Metallic
Simpson Electric
Southw. Indust. Electron.
Sticht Co., Herman H.
Technology Instrument
Triplett Electcl. Instr.
Western Radiation Lab.
Westinghouse Electric
Weston Electcl. Instr.
Winslow Co.

RESISTANCE INDICATORS, Milliohm

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Chicago Indust. Instr. Co.
Davenport Mfg. Co.
Dice Co., J. W.
Electro Instr., Inc.
Industrial Insts., Inc.
Pimex, Inc.
Simpson Electric
Sticht Co., Herman H.

RESISTANCE INDICATORS, Ohm

Allied Radio
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Associated Research
B & H Instr. Co.
Beckman Instruments
Beede Electcl. Instr.
Biddle Co., James G.
Boonton Radio
Bristol Co.
Burlington Instr. Co.
Cambridge Instr. Co.
Chicago Indust. Instr.
Clippard Instr. Lab.
Clough-Brengle
Columbus Products
Dale Instruments
Davenport Mfg. Co.
DeJur-Amsco
Dice Co., J. W.
Douglas Radio Labs.
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Electro Measmts. Inc.
Electronic Dev. Lab.
Electronic Instrument
Electronic Mfg.
Electronic Measmts. Co.
Electro-Tech Equipt.
Esterline-Angus
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Feiler Engrg. Co.
Freed Transformer
Gar Electcl. Instr.
GE
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Greibach Instruments
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Hickok Electcl. Instr.
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Leeds & Northrup
M. B. Mfg. Co.
Marion Electcl. Instr.
Martindale Elect. Co.
Meters, Inc.
Millivac Instruments
Phaostron Co.
Pimex, Inc.
Precision Apparatus
Radio City Products
RCA Div.
Rawson Electcl. Instr.
Reiner Electronics
Roller-Smith
Scientific Specialties
Sensitive Res. Instr.
Shallcross Mfg. Co.
Shasta Div.
Shurite Meters
Simpson Electric
Southw. Indust. Electron.
Sticht Co., Herman H.
Sunshine Scientific
Supreme, Inc.
Technology Instrument
Triplett Electcl. Instr.
Triumph Mfg. Co.
United Optical Mfg.
Virginia Electronics
Welch Mfg. Co., W. M.
Westinghouse Electric
Weston Electcl. Instr.

RESISTANCE LOADING EQUIPMENT

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Eastern Specialty Co.
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Hardwick, Hindle, Inc.
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Precision Resistor Co.
Rex Rheostat
Shallcross Mfg.
States Co.
Thordarson-Meissner
Ward Leonard

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Daven Co.
Dmeter Mfg.
Edcliff Instruments
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Gray Instr. Co.
Leeds & Northrup
Mann Co., Wm. I.
Nesor Alloy Prods.
Pimex, Inc.
Rubicon Co.
Sensitive Res. Instr.
Shallcross Mfg.
Winslow Co.

RESISTANCE STANDARDS, see Standards, Resistance

RESISTANCE THERMOMETERS, see Thermometers, Electrical Resistance

RESISTANCE WIRE

Driver Co., Wilbur B.
Driver-Harris
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Jelliff Mfg. Corp., C. O.
Kanthal Corp.
Ney Co., J. M.
Precision Resistor Co.
Rodale Mfg. Co.

RESISTOR BOBBINS, Precision, Ceramic

American Lava Corp.
Centralab Div.
Clarostat Mfg. Co.
Du-Co Ceramics
General Ceramics
Kirchberger & Co.
Precision Resistor Co.
Polymer Corp. of Pa.
Steatite Div.
Shallcross Mfg.
Stupakoff Div.
Superior Steatite

RESISTOR CORES, Ceramic

American Lava Corp.
Centralab Div.
Du-Co Ceramics
Electronic Mechanics
General Ceramics
International Prods. Co.
International Resistance
Kirchberger & Co.
Lapp Insulator Co.
Mallory & Co., P. R.
O'Hara Waltham Mfg.
Saxonburg Ceramics
Shallcross Mfg.
Steatite Div.
Stupakoff Div.
Superior Steatite

RESISTOR STANDARDS, see Standards, Resistance

RESISTORS, Adjustable

Ace Electronics
Aerovox Corp.
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Allen-Bradley
Anatran Engrg. Corp.
Black, Sivalls & Bryson
Bourns Labs.
Carter Parts Co.
Centralab Div.
Chatham Electronics
Clarostat Mfg. Co.
Continental Carbon
Corbett Science Labs., F. W.
Cutler-Hammer
Dale Products Inc.
Daven Co.
Daystrom-Pacific
De Jur-Amsco
Dmeter Mfg.
Edcliff Instruments
Electro-Mec Laboratory
Erie Resistor
Fairchild Camera
Foxboro Co.
GE. Apparatus Sales
General Radio
Goodyear Aircraft
Hardwick, Hindle, Inc.
Humphrey, Inc.
Instrument Resistors Co.
International Resistance
I. T. E. Circuit Breaker
Lectrohm, Inc.
Leeds & Northrup
Lewis Engrg. Co.
Mallory & Co., P. R.
Model Engrg. & Mfg.
Ohio Carbon Co.
Ohmite Mfg.
Precision Resistance Co.
Reon Resistor
Resistors, Inc.
Rex Rheostat
Rochester Electronics
Rubicon Co.
Sprague Electric
Stackpole Carbon
Sticht Co., Herman H.
Technology Instrument
Topp Industries
Tru-Ohm Prods. Div.
Vectron Inc.
Walker-Jamieson
Ward Leonard
Welch Mfg. Co., W. M.
Westinghouse Electric
Wirt Co.

RESISTORS, Ballast

Amperite Co., Inc.
Clarostat Mfg. Co.
Dmeter Mfg.
GE
Hardwick, Hindle, Inc.
Instrument Resistors, Inc.
Ohio Carbon
Ohmite Mfg. Co.
Precision Parts Co.
Rex Rheostat
Switchcraft, Inc.
Tru-Ohm Prods. Div.
Ward Leonard

RESISTORS, Carbon Composition and/or Variable

Ace Electronics
Aerovox Corp.
Ahrendt Instr. Co.
Allen-Bradley
Beck Bros.
Bendix, Eclipse-Pioneer
Bendix-Pacific
Biddle Co., Jas. G.
Black, Sivalls & Bryson
Bourns Labs.
Bristol Co.
Brown Electro-Measurement
Central Scientific
Centralab Div.
Cinema Engrg. Co.
Clarostat Mfg. Co.
Computer Instruments
Corbett Science Labs.
Cutler-Hammer
Dale Products
Daven Co.
DeJur-Amsco
Eastern Specialty Co.
Edcliff Instruments
Electro-Mec Labs.
Electro Mechanical Div.
Erie Resistor Corp.
Fairchild Camera
Federal Instr. Co.
Ford Engrg. Co.
Ford Instr. Co.
Galetronics Corp.
GE, Apparatus Sales
General Radio
General Scientific Div.
Genisco, Inc.
Giannini & Co.
Glenco Corp.
Goodyear Aircraft
Gray Instr. Co.
Hardwick, Hindle, Inc.
Helipot Corp.
Instrument Resistors Co.
Insuline Corp.
International Resistance
Jarvis Electronics
Keystone Carbon
Lectrohm Inc.
Lectronic Research Labs.
Leeds & Northrup
Lewis Engrg. Co.
Librascope, Inc.
Mallory & Co., P. R.
Markite Co.
Morganite, Inc.
Natl. Carbon Co., Inc.
Natl. Elect. Controller
Ohio Carbon Co.
Ohmite Mfg. Co.
Phaostron Co.
Physics Research
Precision Resistance
Rattray & Co.
Resistors, Inc.
Rex Rheostat
Rubicon Co.
Servotrol Co.
Shallcross Mfg.
Speer Carbon Co.
Stackpole Carbon
Sticht Co., Herman H.
Technology Instr. Div.
Texas Instruments
Thelen Co.
Topp Industries
United Optical
Vectron Inc.
Victory Engrg. Corp.
Ward Leonard
Welch Mfg. Co., W. M.

RESISTORS, Decade

Aerovox Corp.
Cinema Engrg. Co.
Clarostat Mfg.
Dale Products
Daven Co.
Dmeter Mfg.
Eastern Prec. Resistor
Electro Measmts., Inc.
General Radio
Gray Instr. Co.
Hycor Div.
Industrial Insts., Inc.
Leeds & Northrup
Ohmite Mfg.
Phaostron Co.
Pimex, Inc.
Precision Resistor Co.
RHO Engrg. Co.
Rubicon Co.
Shallcross Mfg.
Winslow Co., Inc.

RESISTORS, Deposited Carbon

Aerovox Corp.
Arnhold Ceramics
Brit. Electronic Sales
Clarostat Mfg.
Computer Instruments
Continental Carbon
Dale Products
Daven Co.
Erie Resistor
Hi-Q Div.
International Resistance
Mallory & Co., P. R.
Mepco, Inc.
Phaostron Co.
Pyrofilm Resistor
Shallcross Mfg.
Sprague Electric
Texas Insts., Inc.
Victoreen Instr. Co.
Wirt Co.

RESISTORS, Encapsulated

Aerovox Corp.
Allen-Bradley
Brit. Electronic Sales
Cinema Engrg. Co.
Clarostat Mfg.
Continental Carbon
Dale Products
Daven Co.
Dmeter Mfg.
Eastern Prec. Resistor
Instr. Resistors Co.
International Resistance
K-F Devel. Co.
Mann Co., Wm. I.
Mepco, Inc.
Ohmite Mfg. Co.
Polytechnic Res. & Co.
Precision Resistor Co.
Resistance Prods. Co.
Shallcross Mfg.
Spicer Co., Walter
Wirt Co.

RESISTORS, High Frequency

Aerovox Corp.
Arnhold Ceramics
Beck Bros.
Black, Sivalls, & Bryson
Brit. Electron. Sales
Clarke Instr. Corp.
Clarostat Mfg. Co.
Corning Glass Works
Dale Products
Daven Co.
Empire Devices
Erie Resistor
Fish-Schurman
GE, Apparatus Sales
General Radio
Goodyear Aircraft
Hardwick, Hindle, Inc.
Instrument Resistors Co.
International Resistance
I. T. E. Circuit Breaker
Kay Electric
Leeds & Northrup
Madison Elect. Prods. Div.
Measurements Corp.
Model Engrg. & Mfg.
Mepco, Inc.
Ohio Carbon Co.
Ohmite Mfg. Co.
Phaostron Co.
Polarod Electronics
Polytechnic Res. & Devel.
Pyrofilm Resistor
Rex Rheostat
Resistance Prods. Co.
Sangamo Electric
Shallcross Mfg.
Sprague Electric
Technology Instr. Div.
WacLine, Inc.
Ward Leonard
White Indust. Div., S. S.
Wirt Co.
Zenith Optical Lab.

RESISTORS, High Megohm

Aerovox Corp.
Arnhold Ceramics
Clarostat Mfg.
Dale Products
Federal Telephone & Radio
International Resistance
Mepco, Inc.
Ohio Carbon Co.
Osborne Electric
Pyrofilm Resistor
RHO Engrg. Co.
Resistance Prods. Co.
Shallcross Mfg.
Sprague Electric
Stackpole Carbon
Victoreen Instr. Co.
Westinghouse Electric
White Indust. Div., S. S.
Winslow Co.

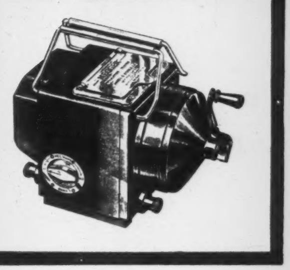
RESISTORS, High Voltage

Arnhold Ceramics
Associated Research
Beck Bros.
Black, Sivalls & Bryson
Bond Electronics
Clark Controller Co.
Clarostat Mfg. Co.
Corbett Science Labs.
Cutler-Hammer
Dale Products
GE, Apparatus Sales
Hardwick, Hindle, Inc.
Instrument Resistors Co.
International Resistance
I. T. E. Circuit Breaker
J B L Instr. Co.
K-F Devel. Co.
Kay Electric
Lectrohm, Inc.
Madison Elect. Prods. Co.
Mepco, Inc.
Micro-Circuits Co.
Ohio Carbon
Ohmite Mfg.
Precision Resistor Co.
RHO Engrg. Co.
Reiner Electronics
Resistance Prods. Co.
Sensitive Res. Instr.
Shallcross Mfg.
Simpson Electric
Sprague Electric
Victoreen Instr. Co.
Ward Leonard
Westinghouse Electric
Weston Electcl. Instr.
White Indust. Div., S. S.

RESISTORS, Manganin

Aerovox Corp.
Associated Research
Avion Instr. Corp.
Beck Bros.
Black, Sivalls & Bryson
Bond Electronics
Brown Electro-Measmt.
Cinema Engrg. Co.
Corbett Science Labs.
Dale Products
Daven Co.
De Jur-Amsco
Eastern Prec. Resistor
Electro-Mec Laboratory
Electronic Devel. Lab.
Federal Instr. Co.
General Radio Co.
Gray Instr. Co.
Hardwick, Hindle, Inc.
Helco Prods. Corp.
Hycor Co., Inc.
I. T. E. Circuit Breaker
Instrument Resistors Co.
Jarvis Electronics Corp.
K-F Devel. Co.
Leeds & Northrup
Madison Elect. Prods. Div.
Mann Co., Wm. I.
Mepco, Inc.
Norton Electrical
Ohmite Mfg.
Osborne Electric
Pimex, Inc.
Precision Line Inc.
Precision Resistor Co.
RHO Engrg. Co.
Radio City Products
Reiner Electronics
Reon Resistor Corp.
Resistance Prods. Co.
Rubicon Co.
Sensitive Res. Instr.
Shallcross Mfg.
Spicer Co., Walter
Sprague Electric
Westinghouse Electric
Winslow Co., Inc.

MEGGER®



ELECTRICAL INSULATION RESISTANCE TESTERS

The performance and endurance records of Megger Instruments are difficult, if not impossible, to match in any type of portable testing device. Sizes range from Midget Megger tool-kit instruments with ratings up to 50 megohms, 500 volts d.c. to Heavy Duty Megger Insulation Testers with special ranges to 200,000 megohms, 10,000 volts d.c. The Meg Type of Megger Insulation Testers (illustrated) in ranges up to 2,000 megohms, 1000 volts d.c. are available in hand-crank, rectifier-operated or dual-operated models.

WRITE FOR INFORMATION ON:

B-521

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Ducters® Earth Reistance Testers . . . Bulletin 25-I.
Ducter® Low Reistance Ohmmeters . . . Bulletin 24-I.

JAMES G. BIDDLE CO.
Electrical & Scientific Instruments
1316 ARCH STREET, PHILADELPHIA 7, PA.

For more information circle **319** on inquiry card.

RESISTORS, Molded

Aerovox Corp.
Allen-Bradley
Beck Bros.
Bond Electronics
Cinema Engrg. Co.
Clarostat Mfg.
Consol. Molded Prods.
Dale Products
Daven Co.
Eastern Prec. Resistor
Erie Resistor Corp.
GE
Glass Products
Hycor Co., Inc.
I. T. E. Circuit Breaker
Instr. Resistors Co.
International Resistance
Keystone Carbon
Lectronic Research Labs.
Mallory & Co., P. R.
Mepco, Inc.
Model Engrg. & Mfg.
Ohio Carbon
Ohmite Mfg. Co.
Precision Parts
RHO Engrg. Co.
Radio City Products
Reiner Electronics
Reon Resistor
Shallcross Mfg.
Speer Carbon
Sprague Electric
Stackpole Carbon
Ward Leonard
White Dental Mfg. Co.
White Indust. Div., S. S.
Wirt Co.

RESISTORS, Negative Temperature Coefficient

Arnhold Ceramics, Inc.
Bendix-Friez
Black, Sivalls & Bryson
Bond Electronics
Brit. Electronic Sales
Clarostat Mfg.
Corbett Science Labs.
Daven Co.
Dmeter Mfg.
Erie Resistor
Federal Telephone & Radio
GE, Metallurg. Prods.
Keystone Carbon
Mepco, Inc.
Micro-Circuits Co.
Model Engrg. & Mfg.
Narda Corp.
Ohio Carbon
Phaostron Co.
Polytechnic Res. & Devel.
Prec. Resistance Co.
Pyrofilm Resistor
RHO Engrg. Co.
Reon Resistor
Rex Rheostat
Shallcross Mfg.
Sprague Electric

FREED
VARIABLE TEST VOLTAGE MEGOHMMETER NO. 1620

The Freed Type 1620 Megohmmeter is a versatile insulation resistance measurement instrument with a continuously variable DC test potential from 50 to 1000 volts.

Components such as transformers, condensers, motors, printed circuits, cables and insulation material can be tested at their rated voltage and above, for safety factor.

- Resistance — 0.1 megohms to 4,000,000 megohms.
- Voltage — variable, 50-1000 volts.
- Accurate — plus or minus 5% on all ranges.
- Simple — for use by unskilled operators.
- Safe — high voltage relay controlled.
- Self contained — AC operated.

ALSO AVAILABLE: Type 1020B MEGOHMMETER — a 500 volt fixed test potential.
Type 2030 PORTABLE MEGOHMMETER — battery operated, 500 volt test potential.

SEND FOR COMPLETE TRANSFORMER AND INSTRUMENT CATALOGS

FREED
TRANSFORMER CO., INC.
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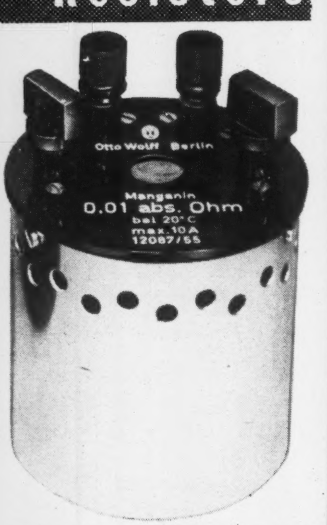

Otto Wolff *Precision* STANDARD Resistors

OTTO WOLFF precision standard resistors offer the following features:

- Accuracy of ±0.01% on all models over entire current range
- 1, 10, 25-watts for air or oil immersion
- Special units to 3000 amp.
- Wide variety of ranges
- Excellent stability and temperature characteristics
- Moderate cost

The OTTO WOLFF precision standard resistors are world famous. They are used by all of the leading laboratories in both the U. S. and Europe. No other resistors combine accuracy, range of values, versatility and construction to the degree found in OTTO WOLFF standard resistors. Also available are Wolff bridges and potentiometers.

0.01 ohm, 1-watt standard resistor.

*Made by OTTO WOLFF Prazisionswiderstande, Berlin.

Representatives for OTTO WOLFF: C. P. GOERZ—VIENNA • GANN—STUTTGART • EMA—ZURICH • CORADI—ZURICH

For complete details of OTTO WOLFF resistors, request Catalog N-6

P.O. Box #555
Hempstead L. I., N. Y.

Physics Research LABORATORIES
House of Fine Instruments
CONSULTANTS IMPORTERS

For more information circle **321** on inquiry card.

States Co.
Stupakoff Div.
Tru-Ohm Prods. Div.
Victory Engrg. Corp.
White Indust. Div., S. S.

RESISTORS, Non-Inductive

Arnhold Ceramics
Associated Research
Automatic Electric
Avion Instr. Co.
Black, Sivalls & Bryson
Bond Electronics
Brit. Electronic Sales
Brown Electro-Measurement
Cinema Engrg. Co.
Clarostat Mfg. Co.
Continental Carbon
Corbett Science Labs.
Corning Glass Works
Dale Products
Daven Co.
Dmeter Mfg.
Eastern Prec. Resistor
Electro-Measmts. Inc.
Electro-Mec Lab.
Elektro-Serv Co.
GE
General Radio
Gray Instr. Co.
Hardwick, Hindle, Inc.
Hycor Co.
Instrument Resistors Inc.
International Resistance
Ircal Industries
I. T. E. Circuit Breaker
K-F Devel. Co.
Kay Electric
Lectrom, Inc.
Leeds & Northrup
Mepco, Inc.
Model Engrg. & Mfg.
Micro-Circuits Co.
Ohio Carbon
Ohmite Mfg.
Osborne Electric
Phaostron Co.
Physics Research
Polytechnic Res. & Devel.
Precision Resistance Co.
Precision Resistor Co.
Pyrofilm Resistor
RHO Engrg. Co.
Reon Resistors Corp.
Resistance Prods. Co.
Resistors, Inc.
Rex Rheostat
Rubicon Co.
Sangamo Electric
Shallcross Mfg. Co.
Spicer Co., Walter
Sprague Electric
States Co.
Texas Insts. Inc.
Tru-Ohm Prods. Div.
Ward Leonard
Western Radiation Lab.
Weston Electcl. Instr.
Winslow Co., Inc.
Wirt Co.
Yonkers Industries

RESISTORS, Precision (accuracy better than 1%)

Aerovox Corp.
Arnhold Ceramics
Bond Electronics
Cinema Engrg. Co.
Clarostat Mfg. Co.
Consol. Res. Co.
Corbett Science Labs.
Dale Products
Daven Co.
Daystrom Instrument
Dmeter Mfg.
Eastern Prec. Resistor
Eastern Specialty Co.
Edcliff Instruments
Electro Measmts., Inc.
Electro-Mec Lab.
Electronic Prods. Co.
Eppley Lab.
Fairchild Camera
GE
General Radio
General Winding Co.
Glass Products
Gray Instr. Co.
Hardwick, Hindle, Inc.
Helco Products
Hycor Div.
Instr. Resistors Co.
International Resistance
Jarvis Electronics
K-F Devel. Co.
Keystone Carbon
Leeds & Northrup
Mepco, Inc.
Metavac, Inc.
Micro-Circuits Co.
Model Engrg. & Mfg.
Morrill & Morrill
Natl. Technical Labs.
Ohmite Mfg.
Osborne Electric
P.C.A. Electronics
Phaostron Co.
Pimex, Inc.
Polytechnic Res. & Devel.
Precision Resistor Co.
Pyrofilm Resistor
RHO Engrg. Co.
Resistance Prods. Co.
Rubicon Co.
Sage Electronics
Servonic Instruments
Shallcross Mfg.
Spicer Co., Walter
Texas Insts., Inc.
Victoreen Instr. Co.
Westinghouse Electric
Yonkers Industries

RESISTORS, Tape

B & H Instr. Co.
Gray Instr. Co.
Gulton Mfg.
Hansen Electronics
Micro-Circuits Co.
Phaostron Co.
Sanders Assocs.

RESISTORS, Temperature Sensitive, see Thermistors

RESISTORS, Voltage Sensitive, see Varistors

RESISTORS, Wire Wound (2 watts and under)

Aerovox Corp.
Automatic Electric
Bond Electronics
Bourns Labs.
Brit. Electronic Sales
Cinema Engrg. Co.
Clarostat Mfg. Co.
Consol. Res. Co.
Corbett Science Labs.
Dale Products
Daven Co.
Daystrom-Pacific
Dmeter Mfg.
Eastern Prec. Resistor
Edcliff Instruments
Electro-Mec Laboratory
GE
General Radio
Hycor Div.
Instr. Resistors Co.
Insuline Corp.
International Resistance
K-F Devel. Co.
Lectrohm, Inc.
Mallory & Co., P. R.
Mann Co., Wm. I.
Mepco, Inc.
Ohio Carbon Co.
Ohmite Mfg. Co.
Osborne Electric
Phaostron Co.
Precision Resistor Co.
RHO Engrg. Co.
Resistance Prods. Co.
Resistors, Inc.
Rubicon Co.
Servonic Instruments
Shallcross Mfg.
Spicer Co., Walter
Texas Insts., Inc.
Winslow Co.
Wirt Co.
Yonkers Industries

RESISTORS, Wire Wound, (4 to 35 Watts) (see also Rheostats)

Aerovox Corp.
Arnhold Ceramics
Brit. Electronic Sales
Clarostat Mfg.
Dale Products
DeJur-Amsco
GE, Apparatus Sales
General Radio
Hardwick, Hindle, Inc.
Instr. Resistors Co.
International Resistance
Lectrohm, Inc.
Malllory & Co., P. R.
Mepco, Inc.
Ohio Carbon
Ohmite Mfg.
Resistors, Inc.
Sage Electronics
Shallcross Mfg.
Sprague Electric
Tru-Ohm Prods. Div.
Ward Leonard
Westinghouse Electric
Wirt Co.

RESISTORS, Wire Wound (35 to 500 Watts) (see also Rheostats)

Aerovox Corp.
Arnhold Ceramics
Brit. Electronic Sales
Clarostat Mfg. Co.
Dale Products
GE, Apparatus Sales
Hardwick, Hindle, Inc.
International Resistance
Lectrohm, Inc.
Mallory & Co., P. R.
Microloc Corp.
Monitor Controller Co.
Ohio Carbon Co.
Ohmite Mfg. Co.
Resistors, Inc.
Rex Rheostat
Shallcross Mfg. Co.
Sprague Electric
Tru-Ohm Prods. Div.
Ward Leonard
Westinghouse Electric
Wirt Co.

RESISTORS, Wire Wound, (500 to 1500 watts) (see also Rheostats)

Brit. Electronic Sales
Clark Controller Co.
GE
Mallory & Co., P. R.
Mullenbach Div.
Ohmite Mfg. Co.
Rex Rheostat
Shallcross Mfg. Co.
Tru-Ohm Prods. Div.
Ward Leonard
Westinghouse Electric

RESISTORS, Woven

Clarostat Mfg. Co.
Leeds & Northrup
Rex Rheostat
States Co.

RESOLVERS, see Synchros

RESTORERS, Thermocouple, see Thermocouple Circuit Tester

RETICLES

American Optical
Bausch & Lomb
Bendix-Eclipse-Pioneer
Bronoptics Co.
Brunson Inst. Co.
Buhl Optical
Bushnell Optical
Dearborn Glass
Dearborn Scientific
Eastman Kodak Co.
Edmund Scientific
Edna Lite Co.
Ercona Corp.
Engineers Specialty Div.
Farrand Optical
Fish-Schurman
Gaertner Scientific
Glass Prods.
Glendale Optical
Goerz Amer. Optical
Gurley, W. & L. E.
International Optical
Herd & Co.
Jaegers, A.
Koehler, W. F.
Leroy Clausing Co.
Levy & Co., Max
Lynn, Robert M.
Mann Co., Wm. I.
Meyer Opticraft
Mico Instr. Co.
Molded Insulation Co.
Nichols, Lyman
Pacific Univ. Prods. Corp.
Palos Optical
Phoenix Prec. Instr.
Photoplating Co.
Plummer & Kershaw
Practo Photo Accs. Corp.
Precision Prods. Co.
Ransom Labs.
Regal Instr. Co.
Renick Co., L. C.
Schneider-Cogswell
Tinsley Labs.
Zenith Optical Co.
Zenith Optical Lab.

REVOLUTION COUNTERS, see Counters, also Tachometers

RHEOSTATS, Battery Charging

Allen-Bradley
Amperite Co.
Beck Bros.
Black, Sivalls & Bryson
Centralab Div.
Clark Controller Co.
DeJur-Amsco
Hardwick, Hindle, Inc.
International Resistance
Mallory & Co., P. R.
Mepco
Natl. Elect. Controller
Ohmite Mfg. Co.
Rex Rheostat
Tru-Ohm Prods. Div.
Ward Leonard

RHEOSTATS, Field

Black, Sivalls & Bryson
Clark Controller Co.
Clarostat Mfg.
Corbett Science Lab.
Cutler-Hammer
Daven Co.
Dittmore & Freimuth
GE, Apparatus Sales
Hardwick, Hindle, Inc.
Model Engrg. & Mfg.
Natl. Elect. Controller
Ohmite Mfg. Co.
Rex Rheostat
Tru-Ohm Prods. Div.
Ward Leonard

RHEOSTATS, Laboratory and/or Meter Testing

Ace Glass Inc.
Allen-Bradley
Amer. Instr. Co.
Beck Bros.
Beckman Instr. Div.
Biddle Co., Jas. G.
Black, Sivalls & Bryson
Borg Equipt. Div.
Bourns Labs.
Brown Electro-Measmt.
Central Scientific
Chicago Apparatus Co.
Corbett Science Lab.
Daven Co.
DeJur-Amsco
Eastern Spec. Co.
Edcliff Instruments
Electro-Mec Lab.
Electronic Associates
Ford Engrg. Co.
G-M Labs.
GE, Apparatus Sales
General Radio Co.
Gray Instr. Co.
Hardwick, Hindle, Inc.
Helipot Div.
Leeds & Northrup
Mallory & Co., P. R.
Mann Co., Wm. I.
Model Engrg. & Mfg.
Natl. Elect. Controller
Ohmite Mfg.
Perkin-Elmer
Rex Rheostat
Rubicon Co.
Schaefer Bros.
Shallcross Mfg.
States Co.
Sticht Co., Herman H.
Technology Instr. Div.
Thwing-Albert
Tru-Ohm Prods. Div.
Ward-Leonard
Welch Mfg. Co., W. M.
Zeiss, Inc., Carl

RHEOSTATS, Slide Wire and Variable (see also Resistors)

Ace Electronics
Allen-Bradley
Amer. Instr. Co.
Amperite Co., Inc.
Beck Bros.
Beckman Instr. Div.
Biddle Co., James G.
Black, Sivalls & Bryson
Borg Equipt. Div.
Bourns Labs.
Brown Electro-Measmt.
Carter Parts Co.
Central Scientific
Chicago Apparatus Co.
Cinema Engrg. Co.
Clark Controller Co.
Computer Instruments
Corbett Science Labs.
Cutler-Hammer
Daven Co.
DeJur-Amsco
Eastern Specialties
Edcliff Instruments
Electro-Measurements
Electro-Mec Lab.
Ford Engrg. Co.
G-M Labs., Inc.
Gallien, R. P.
GE
General Radio Co.
George-Held, Inc.
Giannini & Co.
Gray Instr. Co.
Hardwick, Hindle, Inc.
Helipot Corp.
Jadow Inc., B.
Jarvis Electronics
Jelliff Mfg. Co.
Leeds & Northrup
Mallory & Co., P. R.
Mann Co., Wm. I.
Model Engrg. & Mfg.
National Elect. Controller
Ohmite Mfg. Co.
Perkin-Elmer
Precision Line Inc.
Precision Parts Co.
Precision Resistor Co.
Rex Rheostat
Rubicon
Shallcross Mfg.
Stackpole Carbon
Standard Science Supply
Sticht Co., Herman H.
Technology Instr. Div.
Thwing-Albert
Tru-Ohm Prods. Div.
Van Dyke Instruments
Vectron, Inc.
Ward Leonard
Welch Mfg. Co., W. M.
Winslow Co.
Wirt Co.

RIBBON, Metal, Rolled to Small Fractional Dimensions

Alpha Metals
Amer. Platinum Works
Amer. Silver Co.
Arnold Engrg. Co.
Baird Assocs.-Atomic Instr.
Belmont Smelting
Bishop & Co., J.
Cohn Corp., Sigmund
Driver-Harris
Ney Co.
Penn Precision Prods.
Phosphor Bronze Smltg.
Precision Prods. Co.
Secon Metal Corp.
Sylvania Elect. Prods.
Wilson Co., H. A.

RIDEOMETERS, Ride Comfort Recorders and Riding-quality Instruments

Brush Electronics
Calidyne Co.
Commercial Research
Impact Register Co.
Jaeger Watch
Saxl Instr. Co.
Sperry Products
Testing Machines Inc.

RINGS, COLLECTOR, see Slip Rings

RODS, Amber

Amber Guild, Ltd.
Fish-Schurman

RODS, Beryllium-Copper

Belmont Smelt. & Ref.
Beryllium Corp.
Heitz, Karl, Inc.
Instruments Spec. Co.
Mallory & Co., P. R.
Res. Devel. Manufacture
Scovill Mfg. Co.
Sylvania Elect. Prods.
Wilson Co., H. A.

RODS, Ceramic, Plain or Metallized

Amer. Lava Corp.
Centralab Div.
Du-Co Ceramics
Fish-Schurman
General Ceramics

Insuline Corp.
Lapp Insulator
Leroy Clausing Co.
McDanel Refractory
Saxonburg Ceramics
Steatite Div.
Stupakoff Div.
Superior Steatite
Technical Soldering Co.

RODS, Fused Quartz

Ace Glass
Amersil Co.
Bliley Electric
Edna Lite Co.
Fish-Schurman
GE, Lamp Dept.
Greiner Glassblowing Lab.
Hanovia Chem. & Mfg.
Mann Co., Wm. I.
Phoenix Prec. Instr.
Prec. Glass Prod. Co.
Regal Instr. Co.
Thermal Syndicate, Ltd.
Torrance Glass & Color
Valpey Crystal Corp.

RODS, Glass

Ace Glass
Bache & Co., Semon
Bird & Co.
Corning Glass Works
Crystal Glass Tube
Edna Lite Co.
Fish-Schurman
Glasscraft Co.
Greiner Glassblowing Lab.
Kontes Glass
Mann Co., Wm. I.
Near Corp.
Nester Co., L. G.
Owens-Illinois
Palos Optical
Phoenix Prec. Instr.
Prec. Glass Prods. Co.
Regal Instr. Co.
Stupakoff Div.
Torrance Glass & Color
Uhrig Co.

RODS, Hard Rubber and Plastic

Allegheny Plastics
Amer. Hard Rubber
Amer. Phenolic
Auburn Mfg. Co.
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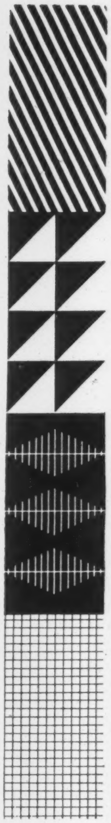

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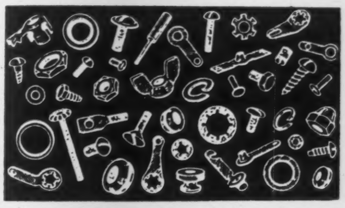

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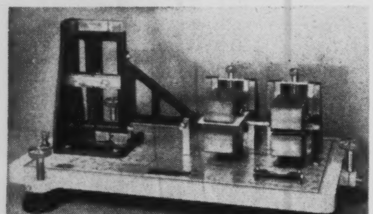

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Heitz, Karl, Inc.
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Jerpbak-Bayless
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Swissomatic Products
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Vallorbs Jewel
Waltham Screw Co.
Watkins Mfg. Co., Inc.
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Bristol Co.
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Ex-Cell-O Corp.
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Mico Instr. Co.
Patterson Co., Wayne D.
Pratt & Whitney
Precision Mfg. Co.
Research Devel. Mfg.
Sphinx American Co.
Std. Automation Prods.
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Gallien, R. P.
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Gruen Watch
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PIC Design Corp.
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SHAKE TABLES, see Vibration Test

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Riverside Metal Co.
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Sherman & Co.
Western Brass Mills
Wilson Co., H. A.

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Fansteel Metallurgical
North Amer. Philips

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Auburn Mfg. Co.
Biggs Co., Carl H.
Blossom Mfg. Co.
Continental-Diamond Fibre
Felt Products
Gair Co., Inc.
Hinde & Dauch
Insulation Mfrs. Corp.
Mitchell Rand Insulating
Spaulding Fibre Co.
National Tel-Tronics
Wilmington Fibre

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Atlantic India Rubber
Auburn Mfg. Co.
Canfield Rubber
Carlyle Rubber
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Detroit Gasket & Mfg.
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Republic Rubber Div.
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Rubatex Div.
Sponge Rubber Prods.
Stokes Rubber
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Haynes Stellite
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SHEETS, Kovar

Driver-Harris
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SHEETS, Monel and Nickel

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Amer. Silver Co.
Crucible Steel Co. of Am.
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Internat. Nickel
Metal Goods Corp.
Sherman & Co.

SHEETS, Plastic

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Allied Engraving
Amer. Hard Rubber
Amer. Phenolic
Auburn Mfg. Co.
Bakelite Div.
Bel-Art Products
Blossom Mfg. Co.
Blum & Co., Julius
Carbide & Carbon
Carroll Co.
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Dynakon Corp.
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Electronic Mechanics, Inc.
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Formica Co.
Garlock Packing Co.
GE, Textolite Dept.
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Synthane Corp.
Taylor Mfg. Co.
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Amer. Silver Co.
Chase Brass & Copper
Driver-Harris
Jessop Steel Co.
Metal Goods Corp.
Sherman & Co.

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Amer. Silver Co.
Armco Steel Corp.
Crucible Steel
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Driver Co., Wilbur B.
Ferner Co.
Hubbell Metals
Jessop Steel
Metal Goods Corp.
Michigan Steel Cast. Co.
Schnitzer Alloy Prods.
Simonds Saw & Steel
Universal-Cyclops

SHIELDS, Lead

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Bar-Ray Products
Division Lead Co.
Instruments Inc.
Nuclear-Chicago
NRD Instr. Co.
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SHIELDS, Transformer

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Millen Mfg. Co.

SHIELDS, Tube

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DuMont Labs., Allen B.
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Waterman Products

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Werner Co., Inc., R. D.
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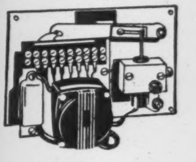

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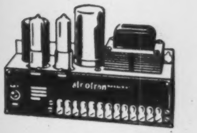

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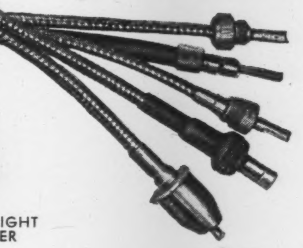

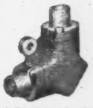

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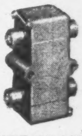

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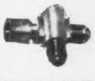

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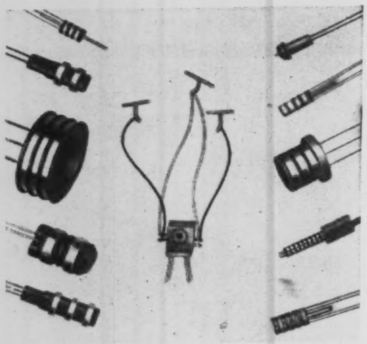

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Winchester Electronics

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SOCKETS, Transistor

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Atlas E-E Corp.
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Circon Component Co.
Felts Corp.
Indust. Hrdw. Mfg. Co.
Sylvania Elect. Prods.

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Birnbach Radio Co.
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Indust. Hrdw. Mfg. Co.
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Johnson Co., E. F
Millen Mfg. Co.
Mycalex Corp. of Amer.
National Tel-Tronics
Remler Co.
Sylvania Elect. Prods.
U. S. Gasket Co.
Vector Electronic Co.
Waldom Electronics
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Sylvania Elect. Prods.
Vector Electronic Co.

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Gardiner Metal Co.
Gallien, R. P.
General Plate Div.
Handy & Harman
Hubbell Metals
Jadow Inc., B.
Krembs Co.
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Ney Co.
Sherman & Co.
Sickles & Sons

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Amer. Silver Co.
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Division Lead Co.
Dixon, Inc., William
Federated Metals Div.
Fusion Engrg. Co.
Gallien, R. P.
Gardiner Metal Co.
GE
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Cerro de Pasco Corp.
Chemalloy Electronics
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Electro Units Supp. Co.
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General Winding Co.
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United States Electronics
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Wetsinghouse Electric
Weston Electcl. Instr.
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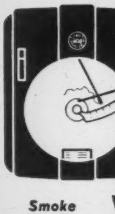
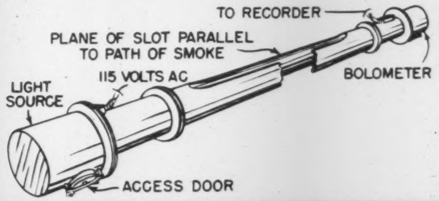


Smoke Density Recorder



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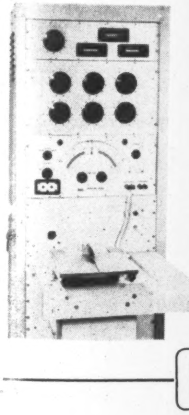

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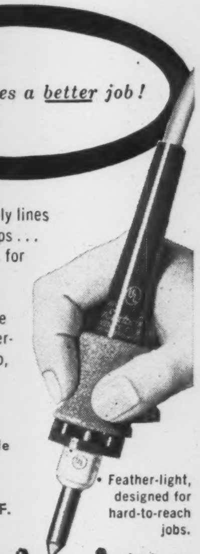

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RCA
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Chicago Apparatus Co.
Corning Glass
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Greiner Glassblowing Lab.
Kimble Glass
Kontes Glass
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Owens-Illinois
Podbielniak, Inc.
Precision Scientific
Scient. Glass App.
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Thomas Co., Arthur H.
Vapor Recovery Systems
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Bristol Co.
Climax Div.
Ess Instr. Co.
Fischer & Porter Co.
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General Controls
Hagan Corp.
Hays Corp.
Instruments Inc.
Lear Inc.
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Minneapolis-Honeywell
  Indust. Div.
Moore Products
Nuclear Research Corp.
Ohmart Corp.
Pheonix Prec. Instr.
Prec. Therm. & Insts.
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Richardson Scale
Roy Co., Milton
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Bendix, Cincinnati Div.
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Builders-Providence
Central Scientific
Century Geophysical
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Fischer & Porter Co.
Fisher Scientific
Foxboro Co.
G. M. Mfg. Co., Inc.
Griebel Co.
H-B Instr. Co.
Hagan Corp.
Hays Corp.
Instruments Inc.
Kahl Scient. Instr.
King Engrg.
Leeds & Northrup
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Minneapolis-Honeywell
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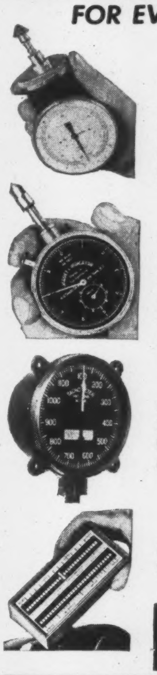

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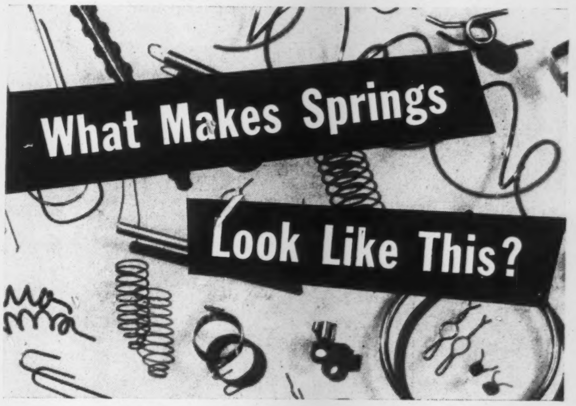

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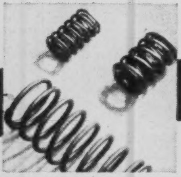
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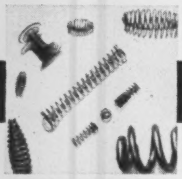
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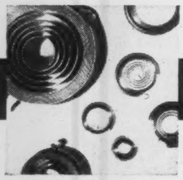
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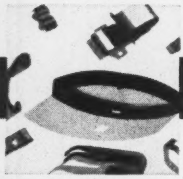
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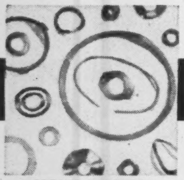
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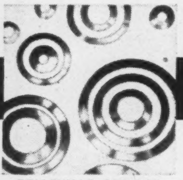
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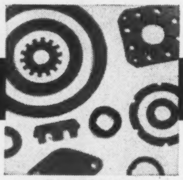
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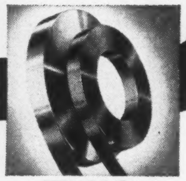
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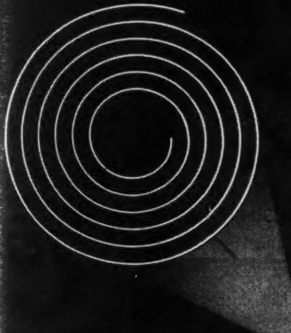

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Hastings-Raydist
Leeds & Northrup
Phoenix Prec. Instr.
Rubicon Co.
Sensitive Res. Instr.
Thwing-Albert
Weston Electcl. Instr.

STANDARDS, Acoustic

Massa Labs.

STANDARDS, Capacitance

Aerovox Corp.
Brown Electro-Measmt.
Cambridge Instr. Co.
Federal Telephone & Radio
General Radio Co.
Industrial Instruments
Leeds &Northrup
MacLeod & Hanopol
Pacific Instruments
Rubicon Co.
Scientific Specialties
Shallcross Mfg. Co.
Simmonds Aerocessories
Solar Mfg. Corp.
United Condenser

STANDARDS, Color

E & S Optical
Fish-Schurman
Gardner Lab.
Hellige, Inc.
Koehler Instr. Co.
Munsell Color Co.
Phoenix Prec. Instr.
Prec. Glass Prods. Co.

let's talk
TORQUE

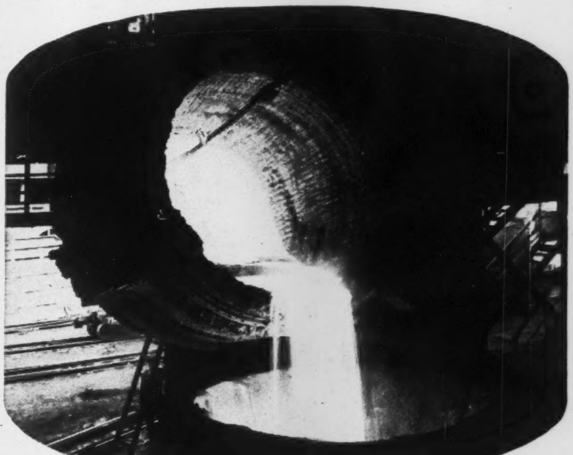
IN TERMS OF TORQUE — *Crosscurving* means longer, smoother, more even delivery of power

You get Dual Power when you use Sandsteel's "Crosscurved" mainsprings in your products. The "Crosscurved" spring tends to expand in the direction in which it is tempered and the crosscurve, which at full wind, is partly flattened out, stores additional energy. You get more energy per wind and a smoother, more even energy distribution. This results in superior performance, greater accuracy and longer life for your product. The "crosscurved" mainspring is original with Sandsteel — means better engineering . . . greater efficiency. Investigate the possibility of using Sandsteel "Crosscurved" mainsprings in your product. We shall be pleased to advise you.

Write for our FREE brochure — "Sandsteel Springs for Your Products"

SANDVIK STEEL, INC.
Sandsteel Spring Division
Fair Lawn, N. J.

For more information circle **344** on inquiry card.



ACCURACY OF TEMPERATURE CONTROL DETERMINES ITS QUALITY

ACCURATE control of temperature or pH is vital to modern heat treating or chemical processing, because only in this way can uniform quality be obtained under mass production conditions.

Potentiometers have made such control possible, and "the heart" of these instruments in most cases, for over 25 years, has been the Eplab Standard Cell. This cell is a "yardstick" for the translation of voltage to temperature. The first commercial cell of its type, constant research has made it "as standard as sterling".

When you buy potentiometers, specify Eplab Standard Cells.

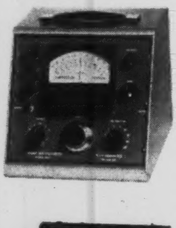
THE EPPLEY LABORATORY, INC.
SCIENTIFIC INSTRUMENTS • NEWPORT, R. I., U. S. A.

EPLAB Standard Cells For Potentiometric Instruments "As Standard as Sterling"

For more information circle **345** on inquiry card.

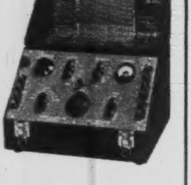
Strain Gage Instrumentation

BAM-1
Bridge Amplifier and Meter



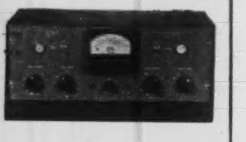
Very convenient general purpose box. Static readings on meter. Dynamic readings on dc 'scope. Transistor dc amplifier with excellent low noise and drift. **Bulletin #6.**

BA-12
Bridge Amplifier



Accurate monitoring of fatigue tests. "Dynamic Null Balance" gives accuracy within 1% on steady dynamic signals. Used with any cathode-ray oscilloscope. **Bulletin #5.**

PM-1 Peak Meter



Holds peak reading from dc to single sharp transient. Electronic clearing and control circuits. Teams with BAM-1 on strain gages. **Bulletin #11.**

Switch and Balance Units, Strain Gage Kit

ELLIS ASSOCIATES

Box 77 **Pelham, New York**

For more information circle **346** on inquiry card.

Tarc Electronics Inc.
Taylor & Co., W. A.
Weston Electcl. Instr.

STANDARDS, Emf, see Standard Cells

STANDARDS, Frequency (see also Forks, Tuning)

ARF Products
Aero Instrument
Amer. Instr. Co.
Amer. Time Prods.
Berkeley Div.
Bliley Electric
Boonton Radio Corp.
Browning Labs.
Central Scientific
Collins Radio Co.
Columbus Products
Crystal Research Labs.
D & R Ltd.
De Mornay-Bonardi
Doolittle Radio
El Mec Labs.
Electronic Devel. Lab.
Espey Mfg.
Federal Telephone & Radio
Feiler Engrg. Co.
Ferris Instr. Co.
Freed Transformer
GE, Instr. Dept.
GE, Telechron Dept.
General Radio Co.
Gertsch Products
Hamilton Watch
Hathaway Instr. Co.
Hewlett-Packard
Hickok Electcl. Instr.
Howell Instr. Co.
Hupp Instrumation
Indust. Test Equipt.
Jacobs Instruments
Kearfott Co.
Kinetic Instr. Co.
Knights Co.
Lavoie Labs.
Lampkin Labs.
MacLeod & Hanopol
Manson Labs.
Marconi Instruments
Measurements Corp.
Millen Mfg. Co.
Narda Corp.
New London Instr. Co.
Philamon Labs.
Polytechnic Res. & Devel.
Potter Instr. Co.
RCA Div.
Radioactive Prods., Inc.
Riverbank Labs.
Servo Corp. of Amer.
Sherron Metallic
Standard Elect. Time
Std. Electronic Res.
Stewart Instr. Co.
Sunshine Scientific
Teletronics Lab., Inc.
Times Facsimile Corp.
Varo Mfg. Co.
Vectron, Inc.
Walkirt Co.
Westport Electric

STANDARDS, Gamma-Ray, see Standards, Radioactivity

STANDARDS, Inductance

Aerovox Corp.
Boonton Radio Corp.
Cambridge Instr. Co.
Dietz Design & Mfg.
Freed Transformer
General Radio Co.
Leeds & Northrup
Pacific Instr. Co.
Rubicon Co.
Scherr Co., Inc.
Shallcross Mfg. Co.
Teletronics Lab.
United Transformer Corp.

STANDARDS, Length

Acme Industrial
Brown & Sharpe
Gaertner Scientific
Griswold Mfg. Co.
Gurley, W. & L. E.
Pratt & Whitney
Renick Co., L. C.
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Starrett Co.
Swedish Gage
Van Keuren Co.
Webber Gage

STANDARDS, Mass

Gurley, W. & L. E.
Seederer-Kohlbusch

STANDARDS, Pressure

Aeromarine Instr. Co.
Coleman Instr. Co.
Doelcam Div.
Green, Henry J.
Meriam Instr. Co.
Morehouse Machine Co.
Prec. Thermom. & Insts.
Scientific Instr. Co.
Wallace & Tiernan

STANDARDS, Radioactivity

Anton Electronic Labs.
Atomic Instr. Co.
Bio-Rad Labs.
Can. Radium & Uranium
El-Tronics, Inc.
Jordan Electronics
Landsverk Electrometer
Menlo Res. Lab.
Nuclear-Chicago
Nucleonic Corp. of Amer.
Pacific Transducer
Technical Associates
Tracerlab
Universal Atomics
U. S. Radium Corp.
Western Radiation

STANDARDS, Resistance

Acton Labs.
Aerovox Corp.
Arnhold Ceramics
Associated Research
Beck Bros.
Cambridge Instr. Co.
Cutler-Hammer
Daven Co.
Eastern Prec. Resistor
Electro-Mec Lab.
Federal Instr. Co.
Federal Telephone & Radio
General Radio Co.
Gray Instr. Co.
Leeds & Northrup
Pimex, Inc.
Rubicon Co.
Sensitive Res. Instr.
Shallcross Mfg. Co.

STANDARDS, Shunt

Associated Research
Burlington Instr. Co.
Cambridge Instr. Co.
DeJur-Amsco
Electronic Devel. Lab.
GE
Gray Instr. Co.
Hickok Electcl. Instr.
Instrument Resistors Co.
Internat. Resistance
Lewis Engrg. Co.
Physics Research
Roller-Smith
Rubicon Co.
Sensitive Res. Instr.
Shallcross Mfg.
Sittler Corp.
Triplett Electcl. Instr.
United Optical
Westinghouse Electric
Weston Electcl Instr.
Winslow Co.

STANDARDS, Sound Level

Audio Instrument Co.
Daven Co.
Dyna Labs.
General Radio
Kay Electric
Massa Lab.

STANDARDS, Surface Roughness and/or Finish

Acme Industrial Co.
Baird Assocs.-Atomic Instr.
Blake Co., Edward
Brush Electronics
Comrar Instr. Co.
DoAll Co.
Engis Equipt. Co.
Gar Prec. Parts, Inc.
GE, Apparatus Sales
GE, Instr. Dept.
Link Engrg. & Mfg.
Micrometrical Mfg.
Opplem Co.
Penn Optical & Instr.
Pipe Machinery Co.
Scherr Co., Inc.
Size Control Co.
Surface Checking Gage
Webber Gage
Ziess, Inc., Carl

STANDARDS, Temperature

Barnes Engrg. Co.
Ever Ready Thermometer
Green, Henry J.
H-B Instrument
Harco Laboratories
Leeds & Northrup
Lewis Engrg.
L & O Research
Moeller Instr. Co.
Palmer Thermometers
Precision Therm.
Revere Co.
Scientific Instr. Co.
Servo Corp of Amer.
Teichert Engrg. Co.
Weksler Thermom. Corp.
Weston Electcl. Instr.

STANDARDS, Time

Amer. Instr. Co.
Amer. Time Prods.
Federal Telephone & Radio
General Radio Co.
Hamilton Watch
Hubb Instrumation
Lavoie Labs.
Moeller Instr. Co.
Potter Instrument
Riverbank Labs.
Rutherford Electronic
Standard Elect. Time Co.
Std. Electronic Res.
Stewart Instr. Co.
Stoelting Co.
Varo Mfg. Co.
Vectron, Inc.

STANDARDS, Volume

Gurley, W. & L. E.
Kontes Glass

STARTERS, Motor

Allen-Bradley
American-Kloeckner
B/W Controller Co.
Bendix Aviation Corp.
Clark Controller Co.
Cutler-Hammer
Cyclohm Div.
Furnas Electric
GE, Apparatus Sales
Ingersoll-Rand
Minneapolis-Honeywell
Monitor Controller Co.
Perkin Engrg. Co.
Raytheon Mfg. Co.
Schauer Mfg. Co.
Small Motors, Inc.
Square D Co.
Synchro-Start
Westinghouse Electric

STATIC ELIMINATORS

C. G. S. Labs.
Can. Radium & Uranium
Hewson Co., Inc.
Hoover Electronics Co.
Nuclear Corp. of Amer.
Robins Industrial Corp.
Sela Electronics Co.
Sticht Co., Herman H.
Superex Electronics
Taller & Cooper
U. S. Radium Corp.

STATION CONTROL EQUIPMENT, see Electric Power Generation Instruments, also Gas Distribution System Instruments

STEAM GOVERNORS, see Boiler Room Instruments

STEAM METERS, see Flowmeters, Inferential Type

STEAM SPECIALTIES, see Boiler Room Instruments

STEEL TAPES, see Tapes, Steel

STELLAR SPECTROSCOPES, see Spectroscopes, Stellar

STEREOSCOPES

Abrams Instr. Co.
Amer. Optical
Avion Div.
Bronoptics Co.
DoAll Co.
Edmund Scientific
Ercona Corp.
Fairchild, Reconnaissance
Flett Lab.
General Biological
Gordon Enterprises
Hacker & Co., W. J.
Meyer Opticraft
Opplem Co., Inc.
QOS Corp.
Stratex Instr. Co.
Wild Heerbrugg
Zeiss, Inc., Carl

STEREOSCOPES, X-ray

Abrams Instr. Co.
Bar-Ray Products
Bausch & Lomb
Fairchild Reconnaissance
GE, X-Ray Dept.
Gordon Enterprises
Kelley-Koett Mfg. Co.
North Amer. Philips
Picker X-Ray
Tracerlab, Inc.
Westinghouse X-Ray Co.

STETHOSCOPES, Engineers

Anco Instr. Div.
Brush Electronics
Engineers Res. & Devel.
Fairchild Camera
Feiler Engrg. & Mfg. Co.
Gilmore, E. R.
Zeiss Inc., Carl

STIFFNESS TESTERS, Paper, see Paper Testing

STILLS, Water (see also Distillation)

Aetna Scientific
Andrew Techn. Supply
Barnstead Still
Central Scientific
Electric Hotpack Co.
Fish-Schurman
General Scientific Equipt.
Labline, Inc.
Penfield Mfg. Co.
Specialty Glass Co.
Stokes Mach. Co., F. J.
Precision Scientific
Thomas Co., Arthur H.
Weber Bros. Metal Works

STIRRERS, Laboratory, Variable Speed

Ace Glass
Alcoe Co., A. S.
Amer. Instr. Co.
Andrew Techn. Supply
Brookfield Engrg. Labs.
Central Scientific
Chicago Surgical & Elect.
Eastern Engrg. Co.
Eberbach & Son
Fish-Schurman
Fisher-Scientific
Greiner Co., Emil
Heller Co., G. K.
Humboldt Mfg. Co.
Kontes Glass
Koehler Instr. Co.
La Pine & Co., A. S.
Labline, Inc.
Martin & Co.
Micro-Metric Instr.
Mixing Equipt. Co.
Omega Machine
Palo Lab. Supplies
Palo-Myres Inc.
Phipps & Bird
Precision Scientific
Refinery Supply Co.
Research Appliance Co.
Sargent & Co., E. H.
Sorvall, Inc., Ivan
Talboys Instr. Corp.
Technical Products
Welch Mfg. Co., W. M.
Western Electric
Wilkens-Anderson

STOP WATCHES, see Watches, Stop

STRAIGHT EDGES

Acme Industrial
Alteneder & Sons, Theo.
Amer. Measg. Instr.
Brown & Sharpe
Bruning Co., Inc.
Collins Microflat Co.
Dietzen Co.
DoAll Co.
Gray Instr. Co.
Griswold Mfg. Co.
Keuffel & Esser
Negus, T. S. & J. D.
Post Co., Frederick
Scherr Co., Inc.
Speidel & Co.
Starrett Co.
Swedish Gage
Taft-Pierce Mfg. Co.
Warren-Knight
Webber Gage
Weber Co., F.
White Co., David

STRAIGHTENING VANES

Amer. Meter Co.
Bailey Meter Co.
Builders-Providence
Daniel Orifice Fitting
Foxboro Co.
Hays Corp.
Meriam Instr. Co.
Penn Insts. Div.
Republic Flow Meters
Robinson Orifice Fitting
Simplex Valve & Meter
Taylor Instr. Cos.

STRAIN GAGES, including Bonded and Unbonded Resistance Type (see also Stress, also Polariscopes)

Acme Industrial
Allegany Instr. Co.
Amer. Instr. Co.
Anderson, Arthur R.
Ann Arbor Instr. Works
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bendix-Pacific
Bristol Co.
Computer Instr. Corp.
Control Devices Inc.
Edin Electronics
Eitzen Co., Louis C.
Electronic Products Co.
Ellis Associates
Federal Products Corp.
Fielden Instr. Div.
Gaydon Co
GE, Apparatus Sales
Giannini & Co.
Gilmore Industries
Greenleaf Mfg. Co.
Gulton Mfg. Co.
Hamilton Watch
Hathaway Instr. Co.
Hays Corp.
Heiland Div.
Industrial Electronics, Inc.
Metzger & Son
Miller Corp., Wm.
Olsen Testing Machine
Pratt & Whitney
Reed Research
Revere Corp.
Riehle Div.
Scientific Enterprises
Sheffield Corp.
Size Control Co.
Starrett Co.
Statham Labs.
Swedish Gage
Technograph Printed Elect.
Testing Machines, Inc.
Thwing-Albert
Trans-Sonic, Inc.

STRAIN-RATE and STRESS-RATE CONTROLLERS

Amer. Electronic Mfg.
Bailey Meter Co.
Barber-Colman
Berkeley Div.
Bristol Co.
Clevite-Brush
Fielden Instr. Div.
Gilmore Industries
Hathaway Instr. Co.
Industrial Control Co.
Industrial Electronics
Pheonix Prec. Instr.
Robertshaw-Fulton
Thwing-Albert
Weighing Components

STRAIN TESTERS, Glass, see Glass Test Instruments

STRAIN-TIME RECORDERS

Allegany Instr. Co.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bristol Co.
Brush Electronics
Cambridge Instr. Co.
Consol. Electrodynamics
Cook Electric
Ellis Associates
Fielden Instr. Div.
Foxboro Co.
Geotechnical Corp.
Gilmore Industries
Hamilton Watch Co.
Hathaway Instr. Co.
Heiland Div.
Helipot Div.
Industrial Electronics
Keuffel & Esser
Opplem Co.
Phoenix Prec. Instr.
Rea Co., J. B.
Ruge Assocs.
Telecomputing Corp.
Thwing-Albert

STRAINERS, Fabricated Wire Cloth

Air-Maze Corp.
Baker & Co.
Keckley Co., O. C.
Michigan Wire Cloth Co.

STRAINERS, Pipeline

Anderson Co., V. D.
Black, Sivalls & Bryson
Cash Co., A. W.
Cash Valve Mfg. Corp.
Cooper Co., Clark
Davis Regulator Co.
DeZurick Shower Co.
Edward Valves, Inc.
Fisher Governor
Hays Mfg. Co.
Henry Valve Co.
Kaye & MacDonald
Keckley Co., O. C.
Kieley & Mueller
Klipfil Valves, Inc.
Leslie Co.
Marsh Corp., Jas. P.
Mason-Neilan Div.
McAlear Mfg. Co.
Nicholson & Co., W. H.
Rockwell Mfg. Co.
Sarco Co.
Schade Valve Mfg. Co.
Schutte & Koerting
Smith Co., S. Morgan
Spence Engrg. Co.
Squires Co., C. E.
Trerice Co.
Watts Regul. Co.

STREAM GAGING INSTRUMENTS, see Hydrologic Instruments

STRESS INDICATORS

Allied Products Div.
Ames Co., B. C.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Brush Electronics
Cambridge Instr. Co.
Daytronic Corp.
Dillon & Co.
Doelcam Div.
DuMont Labs., Allen B.
Ellis Associates
Emery Co., A. H.
Federal Products
GE
Gilmore Industries
Hathaway Instr. Co.
Heiland Div.
Industrial Electronics, Inc.
Kushner, Joseph B.
Lessells & Assocs.
Magnaflux Corp.
Metzger & Son
Metron Instr. Co.
Minnesota Electronics
Polyphase Instr. Co.
Riehle Div.
Ruge Assocs.
Shasta Div.
Statham Labs.
Swedish Gage

STRESS-STRAIN ANALYZERS

Allegany Instr. Co.
Allied Products Div.
Consol. Electrodynamics
Eitzen Co., Louis C.
Electronic Control Sys.
Electronic Tube Corp.
Ellis Associates
Franklin Electronics
Furst Electronics
Hathaway Instr. Co.
Moseley Co.
Polyphase Instr. Co.
Westronics, Inc.

STRESS-STRAIN INDICATORS and/or RECORDERS

Ace Electronics
Allegany Instr. Co.
Allied Products Div.
American Hydromath
Ames Co., B. C.
Anderson, Arthur R.
Ann Arbor Instr. Wks.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Barnes Development
Beckman Instruments
Bristol Co.
Brookfield Engrg. Labs.
Brush Electronics
Cambridge Instr. Co.
Century Geophysical
Chatillon & Sons
Consol. Electrodynamics
Cook Electric
Crescent Engrg. & Res.
Daytronic Corp.
Dillon & Co.
Doelcam Div.
Eitzen Co., Louis C.
Electro Products Labs.
Electronic Products
Electronic Tube Corp.
Ellis Associates
Emery Co., A. H.
Fairchild Electrotech.
Franklin Electronics
Furst Electronics
GE
Gilmore Industries
Greenleaf Mfg. Co.
Hathaway Instr. Co.
Heiland Div.

Helipot Div.
Industrial Electronics
Kybernetes Corp.
Leeds & Northrup
Librascope, Burbank Div.
Magnaflux Corp.
Metron Instruments
Metzger & Son
Mosley, Francis L.
National Forge
Nosker Engrg. Prods.
Offner Electronics
Olsen Testing Machines
Phoenix Prec. Instr.
Polyphase Instr. Co.
Rea Co., J.B.
Riehle Div.
Ruge Assocs.
Scientific Enterprises
Scott Testers, Inc.
Sheffield Corp.
Statham Labs.
Streeter-Amet
Swedish Gage
Taller & Cooper
Thwing-Albert
Trimount Instr. Co.

STRIP, Aluminum, see Sheets, Aluminum

STRIP, Beryllium Copper, see Sheets, Beryllium Copper

STRIP, Stainless Steel

Allegheny Ludlum Steel
Amer. Silver Co.
Armco Steel Corp.
Crucible Steel of Amer.
Davenport Mfg. Co.
Disston & Sons, Inc.
Driver-Harris
Ferm[illegible] Co.
Fischer & Porter Co.
Hubbell Metals
Jessop Steel Co.
Metal Goods Corp.
Michigan Steel Cast. Co.
Schnitzer Alloy Prods.
Simonds Saw & Steel
Universal-Cyclops

STRIP-CHART RECORDERS, see Recorders, also Object of Measurement

STROBOSCOPES

Associated Research
Berkshire Labs.
Biddle Co., Jas. G.
Boulin Instr. Co.
Bronoptics Co.
Commercial Research
Communication Meas. Lab.
Computer Co. of Amer.
Conn, Ltd., C. G.
Dormitzer Elect. & Mfg.
Edgerton, Germeshausen
Elect. Eye Equipt. Co.
Electronic Engineers
Electronic Measmts. Co.
Endevco Corp.
Engrg. Res. & Devel.
Epic, Inc.
Fruengel Inc.
General Radio Co.
Huggins Labs.
Ideal Laboratory Tool
Internat. Res. & Devel.
Kemlite Labs.
Mercury Electronic Co.
Opad Electric
Sylvania Elect. Prods.
Wabash Instrs. & Spec.
Welch Mfg. Co., W. M.
Westinghouse Electric
Zeiss, Inc., Carl

STRUCTURAL SHAPES

American Brass Co.
Breeze Corp.
Centralab Div.
Gervos Instr. Co.
Hubbell Metals
Keystone Carbon Co.

STYLI, Agate Point

Duotone Co.
King Gem Co.
Vallorbs Jewel Co.

STYLI, Sapphire, Recording

Bird & Co.
Duotone Co.
Elgin Natl. Watch
Gatti, Inc., Aurele M.
Impact Register
King Gem Co.
Powers, George
Reeves Soundcraft
Steel Co., Herman D.
Swiss Jewel Co.
Vallorbs Jewel
Worley Jewel Co., John

STYLI, Tungsten, Recording

Alden Systems Co.
Cleveland Tungsten Mfg.
Duotone Co.
[illegible] Co.
Vallorbs Jewel Co.
Willey's Carbide Tool Co.
Worley Jewel Co.

SULPHUR DIOXIDE INDICATORS, and/or RECORDERS, see Gas Analyzers

SUN COMPASSES, see Compasses, Sun

SUNSHINE INDICATORS and/or RECORDERS

Bendix-Friez
Bristol Co.
Cambridge Instr. Co.
Friez Instr. Div.
G
G. M. Mfg. Co., Inc
Instruments Corp.
Leeds & Northrup
Taylor Instr. Co.
Virginia Electronics
White Co., Inc.

SUPERVISORY CONTROL EQUIPMENT and SYSTEMS, see Control Systems, also Telemetering

SUPPORTS, Cable and Tubing, see Tubing Supports

SURFACE FINISH INSTRUMENTS, see Dimensional Gages, Surface

SURFACE FINISH SPECIMENS, see Standards, Surface Finish

SURFACE INDICATORS, see Dimensional Gages, Surface

SURFACE PLATES, Glass

Acme Scientific
Bausch & Lomb
Binswanger & Co.
Bronoptics Co.
Cal-Astro Optical Labs.
Clark & Sons
Collins Microflat Co.
DoAll Co.
E & S Optical
E & W Optical
Esco Products
Fecker, Inc.
Fish-Schurman
Georator Corp.
Jones Optical Works
Lab. Optical Co.
Leroy M. E. Clausing
Mann Co., Wm. I.
Palos Optical
Regal Instr. Co.
Scherr Co., Inc.
Tinsley Laboratories
Unertl Optical
Zeiss, Inc., Carl
Zenith Optical Lab.

SURFACE PLATES, Stone

Brown & Sharpe
Bryant Chucking Grinder
Collins Microflat Co.
DoAll Co.
E & W Optical
Herman Stone Co.
Scherr Co., Inc.
Size Control Co.
Taft-Pierce

SURFACE TEMPERATURE INSTRUMENTS, see Thermometers, Surface

SURFACE TENSION INSTRUMENTS (see also Balances)

Cambridge Instr. Co.
Natl. Instr. Labs.
Thomas Co., Arthur H.

SURVEY FOOT-ODOMETERS, see Odometers

SURVEYING INSTRUMENTS, including Aneroid Type

Abrams Instr. Co.
Ainsworth & Sons
Alpha Instr. Co.
Amer. Paulin System
Askania-Werke A. G.
Beckman Div.
Berger & Sons
Branson Instr. Co.
Bliss & Co.
Bray Optical
Brunning Co., Inc.
Dietzgen Co.
Eastern Science Co.
Engis Equipt. Co.
Ercona Corp.
Ferner Co., Inc.
Garlyn Engrg. Co.
Geier & Bluhm
Goldak Co.
Gordon Enterprises
Graf-Apsco
Gurley, W. & L. E.
Hastings-Raydist
Hyde Instr. Co.
Jarrel-Ash
Kenyon Instr. Co.
Keuffel & Esser
Leupold & Stevens
Los Angeles Scient. Instr.
Lufkin Rule Co.
Meyer-Opticraft
Mikron Instruments
Moran Instr. Corp.
NRD Instrument Co.
Nuclear-Chicago
Opplem Co., Inc.
Pittsburgh Instr. & Mach.
Post Co., Frederic
Republic Lens Co.
Shepard Labs.
Speedometer Electric
Speidel & Co.
Sperry-Sun Well Survey
Sprengnether Instr. Co.
Starrett Co.
Stratex Instr. Co.
Suverkrop Instruments
Thermometer Corp.
Ulmer Co., J. C.
United States Blue Print
Univ. Atomics Corp.
Wallace & Tiernan
Warren-Knight
Weber & Co.
White Co., Inc.
Wild Heerbrugg
Wood Counter Lab.
Zeiss, Inc., Carl.

SURVEYING INSTRUMENTS, Underground, for wells or bore holes (see also Geophysical Instruments, also Oil Well Instruments)

Anton Electronic Labs.
Berger & Sons
Bruning Co., Inc.
Eastman Oil Well
Engineering Labs., Inc.
Engis Equipt. Co.
Georator Corp.
Gurley, W. & L. E.
Halliburton Oil Well
Heiland Div.
Jarrel-Ash
Jordon Electronics
Los Angeles Scient. Instr.
Mt. Sophis Instr. Corp.
Menlo Research Lab.
Radioactive Products
Sperry-Sun Well Surveying
Univ. Atomics Corp.
Victoreen Instr. Co.
Warren-Knight
White Co.

SURVEYOR'S CHAINS, see Surveying Instruments

SURVEYORS' FOOT METERS

Speedometer Electric
Wild Heerbrugg

SUSPENSION RIBBON

Baker & Co., Inc.
Cohn Mfg. Co., Sigmund
Manross & Sons, Div.
Miller Corp., William
Precision Products
Secon Metals Corp.

SWITCHBOARDS

General Control Co.
GE, Apparatus Sales
Gustaveson, Inc.
Lake Erie Electric
Mullenbach Div.
Std. Elect. Time Co.
U. S. Instr. Corp.
Virginia Electronics
Westinghouse Electric

SWITCHES, Air Operated

Aero Instr. Co.
Aeromarine Instr. Co.
Automatic Control Co.
Automatic Temp. Control
Automation Prod. Inc.
Barksdale Valves
Bellows Co.
Black, Sivalls & Bryson
Bristol Co.
CBS-Hytron Div.
Century Electronics & Inst·
Climax Div.
Cook Electric
Cooper Co., Clark
Dietz Co., Henry G.
Dwyer Mfg. Co.
Furnas Electric
Gas Appliance Specialties
GE
Giannini & Co., G. M.
Hetherington, Inc.
Hobbs, John W.
Johnson Service Co.
Manning, Maxwell & Moore
Mason-Neilan Div.
Meletron Corp.
Mercoid Corp.
Miller-Robinson
Minneapolis-Honeywell
  Indust. Div.
Mu-Switch Corp.
Powers Reg. Co.
Rotron Div.
Seely Instr. Co.
Servonic Instruments
Shallcross Mfg. Co.
Weighing Components
Westinghouse Electric
Weston Electcl. Instr.

SWITCHES, Counteractuating

Anatran Engrg. Corp.
Autom. Elect. Sales Corp.
Cook Electric
Daystrom Instr. Div.
Dittmore & Freimuth
Electrical Devel.
Electro-Snap Switch
Electro-Tech. Equipt. Co.
Endevco Corp.
Farmer Electric
Hetherington, Inc.
International Std. Trading
Jo-Bell Products Div.
Landis & Gyr
Micro Switch Div.
Post Machinery Co.
Production Instr. Co.
Recora Co.

SWITCHES, Instrument, including Wiping, Selecting, etc.

Acro Mfg. Co.
Adams & Westlake
Aerovox Corp.
Allied Control Co., Inc.
American Phenolic
Automatic Electric
Breeze Corporations
Bristol Co.
Brit. Electronic Sales Co.
Carter Parts Co.
Centralab Div.
Cinema Engrg. Co.
Clarostat Mfg. Co.
Cook Electric
Dalmotor Co.
Daven Co.
Eastern Specialty Co.
Electro Devel. Co.
Electro-Miniatures Corp.
Electro-Snap Switch
Electro Switch Corp.
Electro Tec Corp.
Endevco Corp.
Federal Screw Prods.
Foxboro Co.
General Control Co.
GE
General Radio Co.
Gervos Instruments
Giannini & Co., G. M.
Globe Industries
Grammes & Sons, Inc.
Grayhill
Hart Mfg. Co.
Haydon Switch, Inc.
Hetherington, Inc.
Hunter Spring Co.
Illinois Testing Labs.
Insuline Corp. of Amer.
Internat. Instruments
J-B-T Insts., Inc.
Kulka Elect. Mfg.
Landis & Gyr
Leeds & Northrup
Lewis Engrg. Co.
Mason Electric
Mercoid Corp.
Merkle Korff Gear Co.
Micro Switch Div.
Microloc Corp.
Molded Insulation Co.
Mossman, Inc., Donald
Oak Mfg. Co.
Ohmite Mfg. Co.
Phaostron Co.
Pollak Corp., Joseph
Precision Parts Co.
Production Instr. Co.
Reisner Mfg. Co.
Roller-Smith
Sealectric Switch & Relay
Shallcross Mfg. Co.
Switchcraft, Inc.
Struthers-Dunn
Thwing-Albert
Unimax Switch Div.
U. S. Instr. Corp.
Weller Mfg. Co.
Wells Co., Gary
Winslow Co., Inc.
Wirt Company

SWITCHES, Key

Aerovox Corp.
Allen-Bradley
Amer. Kloeckner-Moeller
Automatic Electric
Autom. Elect. Sales Corp.
Central Scientific
Cinema Engrg. Co.
Clare & Co., C. P.
Cutler-Hammer
Foxboro Co.
General Control Co.
Hetherington, Inc.
Kellogg Switchboard
Mallory & Co., P. R.
Mossman, Inc., Donald
North Electric
Switchcraft, Inc.
Thermo-Electric Co.
Winslow Co., Inc.

SWITCHES, Knife

Aerolite Electronics
Amer. Kloeckner-Moeller
Cutler-Hammer
GE, Apparatus Sales
Hetherington, Inc.
Insuline Corp. of Amer.
Rodale Mfg. Co.
Winslow Co., Inc.

SWITCHES, Limit

Acro Mfg. Co.
Acro-Mu Switch Div.
Allen-Bradley
Amer. Kloeckner-Moeller
Assembly Products
Autom. Elect. Sales Corp.
Cook Electric
Cutler-Hammer
Denison Mfg. Co., R. B.
Electro-Snap Switch
Farmer Elect. Prods.
Furnas Electric
General Control Co.
General Controls Co.
GE, Apparatus Sales
Haydon Switch, Inc.
Ideal-Aerosmith
Illinois Tool Works
Jo-Bell Products, Inc.
Mercoid Corp.
Micro Switch Div.
Monitor Controller Co.
Sealectric Switch & Relay
Spencer Thermostat Div.
Unimax Division
United Electric Controls
Westinghouse Electric

SWITCHES, Magnetic

Allen-Bradley
Allied Control Co.
Allis-Chalmers
Amer. Kloeckner-Moeller
Anatran Engrg. Corp.
Arizona Ceramics, Inc.
Arnoux Corp.
Arrow-Hart & Hegeman
Autocall Co.
Autom. Switch Co.
Autom. Temp. Control
Butler Mfg.
Clark Controller Co.
Cooper Co., Clark
Cook Electric
Cutler Hammer
Doelcam Div.
Elgin Natl. Watch
Furnas Electric
General Cement Mfg.
GE, Apparatus Sales
Guardian Elect. Mfg. Co.
H-B Instrument
Hart Mfg. Co.
Hetherington, Inc.
Jaidinger Mfg. Co.
Jo-Bell Products
Lumenite Electronic
Mack Electric Devices
Mercoid Corp.
Micro Switch Div.
Monitor Controller Co.
Monroe Calc. Mach. Co.
Ohmite Mfg. Co.
Pollak Corp.
Post Machinery Co.
Potter Instr. Co.
Revere Corp. of Amer.
Ronar, Inc.
Soreng Products
Tork Clock
Vickers Electric Div.
Ward Leonard Electric
Westinghouse Electric
Zenith Electric

SWITCHES, Mercury

Almo Mfg. Co.
Arizona Ceramics, Inc.
Arrow-Hart & Hegman
Climax Div.
Chatham Electronics
Continental Electric
Detroit Controls Corp.
Durakool, Inc.
Ebert Electronics
Edna Lite Co.
Electric Switch Corp.
Electcl. & Phys. Instr.
Electronic Apparatus
Electronic Products
Electro-Tech Equipment
Flett Lab
Fredericks, George E.
General Cement Mfg.
General Controls Co.
GE
Glass-Soldering Engrg.
Gordos Corp.
Guardian Elect. Mfg. Co.
H-B Instr. Co.
Hermaseal Co., Inc.
Hetherington, Inc.
Kahl Scientific Instr.
Landis & Gyr
Littelfuse, Inc.
Mack Electric Devices
Magnetrol Inc.
McAlear Mfg. Div.
Mercoid Corp.
Mercury Contacts
Micro Switch Div.
Mt. Sopris Instr. Corp.
Powrex Switch Co.
R-B-M Mfg. Co.
Radiation Counter Labs.
Rhodes, Inc.
Ronar, Inc.
Standard Electrical Prods.
Tensitron, Inc.
Tigerman Engrg. Co.
Victoreen Instr. Co.

SWITCHES, Pressure

Acro-Mu Switch Div.
Aero Instr. Co.
Air Associates
Allen-Bradley
Amer. Kloeckner-Moeller
Assembly Products
Autom. Control Co.
Automation Prods., Inc.
Barksdale Valves
Bendix-Friez
Black, Sivalls & Bryson
Bristol Co.
Carruthers & Fernandez
Century Electronics & Insts.
Colvin Labs., Inc.
Cook Electric Co.
Cooper Co., Clark
Cutler-Hammer
Dietz Co., Henry G.
Dwyer Mfg. Co., F. W.
Furnas Electric
General Controls Co.
GE, Apparatus Sales
Giannini & Co., G. M.
Guardian Elect. Mfg. Co.
Halax Corp.
Hawk Tool & Engrg. Co.
Hays Mfg. Co.
Healy-Ruff
Henschel Corp.
Johnson Service Co.
Lear, Inc.
Mallory & Co., P. R.
Meletron Corp.
Mercoid Corp.
Minneapolis-Honeywell
  Indust. Div.
Natl. Pneumatic Co.
Phaostron C.
Recora Co.
Riverside Mfg.
Sarco Co.
Servonic Instruments
Shallcross Controls
Slater Electric
Synchro-Start Products
Ultradyne Engrg. Labs.
United Electric Controls
U. S. Gauge Div.
Vickers, Inc.
Viking Instruments
Westinghouse Electric

SWITCHES, Push Button

Acro-Mu Switch Div.
Alden Products
Allen-Bradley
Amer. Kloeckner-Moeller
Arizona Ceramics Inc.
Autom. Elect. Sales Corp.
Brit. Electronic Sales Co.
Carter Parts Co.
Clark Controller
Control Products, Inc.
Cooper Co., Clark
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For External Drive

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2 Poles—60 Contacts
300 Contacts Per Second

2 Poles—90 Contacts
1800 Contacts Per Second

1 Pole—60 Contacts
For External Drive

5 Poles— 45
For External

3 Poles—60 Contacts
For External Drive

4 Poles—30 Con
30 Contacts Per S

5 Poles—60 Contacts
For External Drive

3 Poles—30 Conta
30 Contacts Per Sec

1 Pole—80 Contacts
For External Drive

1 Pole—60 Contacts
1200 Contacts Per Secon

2 Poles—60 Contacts
00 Contacts Per Second

4 Poles—8 Segments
For External Drive

Poles—30 Contacts
Contacts Per Second

2 Poles—90 Contacts
450 Contacts Per Second

les—30 Contacts
ontacts Per Second

6 Poles—90 Contacts
For External Drive

—60 Contacts
xternal Drive

2 Poles—30 Contacts
30 Contacts Per Second

3 Poles—60 Contacts
For External Drive

3 Poles—30 Contacts
For External Drive

2 Poles—64 Contacts
For External Drive

1 Pole—60 Contacts
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6 Poles—24 Contacts
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800 Contacts Per Second

1 Pole—60 Contacts
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Hart Mfg. Co.
Haydon Switch, Inc.
Henschel Corp.
Hetherington, Inc.
Illinois Tool Works
Insuline Corp of Amer.
Jaidinger Mfg. Co.
Kellogg Switchboard
Kirkland Co., H. R.
Leeds & Northrup
Mallory & Co., P. R.
Micro Switch Div.
Monitor Controller Co.
Mossman, Inc., Donald P.
Oak Mfg. Co.
Phaostron Co.
Pollak Corp., Joseph
Sealectric Switch & Relay
Shallcross Mfg. Co.
Spencer Thermostat Div.
Square D Co.
Stackpole Carbon Co.
Switchcraft
Thermo-Electric Co.
Tigerman Engrg. Co.

SWITCHES, Pyrometer

Acro-Mu Switch Div.
Arrow-Hart & Hegeman
Assembly Products
Barber-Colman
Bristol Co.
Daven Co.
Engelhard, Chas.
Foxboro Co.
General Cement Mfg.
GE, Apparatus Sales
Gordon Co., Claud S.
Illinois Testing Labs.
J-B-L Instr. Co.
Leeds & Northrup
Lewis Engrg. Co.
Mack Electric Devices
Mallory & Co., P. R.
Minneapolis-Honeywell
  Indust. Div.
Pyrometer Instr. Co.
Revere Corp.
Rowe Engrg. Co.
Shallcross Mfg. Co.
Thermo-Electric Co.
Thwing-Albert
Triplett Electcl. Instr.
United States Instr. Corp.
Westinghouse Electric
Weston Electcl. Instr.
Wheelco Instr. Div.
Winslow Co.

SWITCHES, Relay,
see Relays

SWITCHES, Rotary,
including Selector

Acro-Mu Switch Div.
Aerovox Corp.
Airflyte Electronics
Allard Instr. Co.
Allen-Bradley
Allied Control Co.
Allis-Chalmers
Amer. Kloeckner-Moeller
Anatran Engrg. Co.
Applied Science Corp.
Arizona Ceramics
Arnhold Ceramics
Arrow-Hart & Hegeman
Autocall Co.
Automatic Electric
Autom. Elect. Sales Co.
Barber-Colman
Betts & Betts
Bird Electronic
Black, Sivalls & Bryson
Bristol Co.
Brit. Electronic Sales Co.
Brown Electro-Measmt.
Cardwell Mfg. Co.
Carter Parts Co.
Centralab Div.
Cinema Engrg. Co.
Clare & Co., C. P.
Clark Instr. Co.
Clarostat Instr. Co.
Computer Insts. Corp.
Consol. Electrodynamics
Cook Electric
Cutler-Hammer
Daven Co.
Daystrom Instr. Div.
Detroit Controls Corp.
Dittmore & Freimuth
Eastern Prec. Resistor Co.
Eastern Spec. Co.
Elcor, Inc.
Electro Devel. Co.
Electro Devices Inc.
Electro-Miniatures Corp.
Electro-Snap Switch
Electro Switch Corp.
Electro Tec Corp.
Elematic Equipt. Corp.
Elgin Natl. Watch
Farmer Electric
Federal Telephone & Radio
Foxboro Co.
Furnas Electric
General Cement Mfg.
General Control Co.
General Devices, Inc.
GE, Apparatus Sales
General Radio Co.
Globe Industries, Inc.
Gray Instr. Co.
Grayhill
H-B Instr. Co.
Hart Mfg. Co.
Haydon Switch, Inc.
Henschel Corp.
Hetherington, Inc.
Illinois Testing Labs.
Industrial Instrument
Instrument Dev. Labs.
Insuline Corp. of Amer.
Internat. Instruments
J-B-L Instr. Co.
J-B-T Insts., Inc.
Kellogg Switchboard
Lear, Inc.
Leeds & Northrup
Leland, Inc., G. H.
Lewis Engrg. Co.
Mallory & Co., P. R.
Mason Electric
Meter Devices Co.
Micro Switch Div.
Microloc Corp.
Minneapolis-Honeywell
  Indust. Div.
Monitor Controller Co.
Mossman, Inc., D. P.
North Electric
Oak Mfg. Co.
Ohmite Mfg. Co.
Phaostron Co.
Photocircuits Corp.
Pollak Corp., Joseph
Revere Co.
Roller-Smith
Rubicon Co.
Sealectric Switch & Relay
Sensitive Research Instr.
Shallcross Mfg. Co.
Soreng Products
Square D Co.
Swanson Engrg. Co.
Thermo-Electric Co.
Thompson Products
Thwing-Albert
Tigerman Engrg. Co.
Triplett Electcl. Instr.
United Optical
U. S. Instr. Corp.
Utah Radio Prods.
Vapor Recovery Systems
Vectron, Inc.
Ward Leonard Electric
Westinghouse Electric
Wheelco Instr. Div.

SWITCHES, Sealed

Adams & Westlake
Allied Control Co.
Autom. & Prec. Mfg. Co.
Clarostat Mfg. Co.
Cook Electric
Cutler-Hammer
Denison Mfg. Co., R. B.
Ebert Electronics
Edison, Inc., Thomas A.
Electronic Products
Electro-Snap Switch
Fasco Industries
General Controls Co.
GE
Giannini, G. M.
Grayhill
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Hart Mfg. Co.
Haydon Switch, Inc.
Hermaseal Co., Inc.
Hetherington, Inc.
Illinois Tool Works
Insuline Corp. of Amer.
Jo-Bell Products
Kurman Electronics
Mack Electric Devices
Mallory & Co., P.R.
Mason Electric
Micro Switch Div.
Ohmite Mfg. Co.
Phaostron Co.
R-B-M Mfg. Co.
Revere Corp. of Amer.
Sealectric Switch & Relay
Servonic Instruments
Shallcross Mfg. Co.
Spencer Thermostat Div.
Unimax Switch Div.

SWITCHES, Snap Action

Acro-Mu Switch Div.
Allen-Bradley
Amer. Kloeckner-Moeller
Arizona Ceramics, Inc.
Arnhold Ceramics
Arrow-Hart & Hegeman
Autom. Electric
Autom. Temp. Control
Betts & Betts
Black-Sivalls & Bryson
Brit. Electronic Sales Co.
Carter Parts Co.
Channer Corp.
Clark Controller Co.
Clarostat Mfg. Co.
Comar Electric
Control Products
Cook Electric
Cooper Co., Clark
Cutler-Hammer
Denison Mfg. Co., R. B.
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Electro Switch Corp.
Fenwal, Inc.
General Cement Mfg.
General Controls Co.
GE, Apparatus Sales
Grayhill
Guardian Elect. Mfg. Co.
Hart Mfg. Co.
Hawk Tool & Engrg. Co.
Haydon Switch,Inc.
Hermetic Sealing Corp.
Hetherington, Inc.
Illinois Tool Works
J-B-L Instr. Co.
J-B-T Insts., Inc.
Jaidinger Mfg. Co.
Jo-Bell Products
Leeds & Northrup
Mallory & Co, P. R.
Manning, Maxwell & Moore
Mason Electric Corp.
McAlear Mfg. Div.
Mercoid Corp.
Micro Switch Div.
Miller-Harris Instr.
Mu Switch Corp.
Perfex Corp.
Phaostron Co.
Pollack Corp., Joseph
Revere Corp.
Sealectric Switch & Relay
Soreng Products
Spencer Thermostat Div.
Square D Co.
Stackpole Carbon
Thermador Electcl. Mfg.
Torsion Balance
Ulanet Co.
Unimax Division
United Electric Controls
Ward Leonard Electric
Wirt Company

SWITCHES, Stepping,
including Motors, Step
Type (see also Relays)

Amer. Phenolic Corp.
Autom. Electric
Autom. Elect. Sales Corp.
Barber-Colman
Clare & Co., C. P.
Cook Electric
Cutler-Hammer
Daven Co.
Dietz Co., Henry G.
Electro Tec Corp.
General Control Co.
GE
Giannini & Co.
Guardian Electcl. Mfg. Co.
Hetherington, Inc.
Kellogg Switchboard
Leetronics, Inc.
Leland, Inc.
Mallory & Co., P. R.
Mason Electric
North Electric
Oak Mfg. Co.
Phaostron Co.
Precision Parts Co.
Recora Co.
Sealectric Switch & Relay
Shallcross Mfg. Co.
Stepper Motors Corp.

SWITCHES, Thermostatic

Acro-Mu Switch Div.
Advance Electric
Allen-Bradley
Barber-Colman
Bendix, Friez
Betts & Betts
Bridgeport Thermostat
Bristol Co.
Burling Instr. Co.
Control Products
Cook Electric
Cutler-Hammer
Dickson Co.
Edison, Inc., Thomas A.
Fenwal, Inc.
General Cement Mfg.
General Controls Co.
GE, Apparatus Sales
Gleason-Avery
G-V Controls
Hart Mfg. Co.
Hawk Tool & Engrg. Co.
H-B Instruments Co.
Intercontinental Dynamics
Jaidinger Mfg. Co.
Mack Electric Devices
Manning, Maxwell & Moore
Mech. Industs. Prodn. Co.
Mercoid Corp.
Micro Switch Div.
Minitec
Mu-Switch Corp.
Perfex Corp.
Powers Reg. Co.
Prec. Thermom. & Insts.
Reynolds Electric
Scaico Controls
Shallcross Mfg. Co.
Spencer Thermostat Div.
Struthers-Dunn
Thwing-Albert
Ulanet Co.
Unimax Switch Corp.
United Control Corp.
United Electric Controls
United Electronic Controls
Viking Instruments
Ward Leonard Electric
Weston Electcl. Instr.
Wheelco Instr. Div.

SWITCHES, Time

A'G'A Div.
Acro-Mu Switch Div.
Aemco Inc.
Alina Corp.
Allen-Bradley
Anderson, A. & J. M.
Autocall Co.
Autom. Electric
Autom. Temp. Control
Barber-Colman
Betts & Betts
Bristol Co.
Bristol Motor Div.
Central Scientific
Cincinnati Time Rec.
Clark Controller Co.
Cook Electric
Cramer Controls Corp.
Cutler-Hammer
Dietz Co., Henry G.
Dietz Design & Mfg.
Dimco-Gray
Durakool Inc.
Eagle Signal Corp.
Edison Instr. Div.
Electric Switch Corp.
Electro-Tech. Equipt.
Electronic Specialty Co.
Electyme Motor Prods.
Elgin Natl. Watch
Ferrara, Inc.
General Cement Mfg.
General Control Co.
General Controls Co.
GE, Apparatus Sales
GE, Instrument Dept.
GE, Telechron Dept.
Guardian Electl. Mfg.
G-V Controls
Haledy Electronic Co.
Haydon Co., A. W.
Haydon Mfg. Co.
Hetherington, Inc.
Industrial Timer Corp.
Internat. Register Co.
Jaidinger Mfg. Co.
Kopp Scientific
Landis & Gyr
Leich Electric
Liebel-Flarsheim
Lumenite Electronic
Lux Clock
Mallory & Co., P. R.
Miller-Harris Instr. Co.
Minneapolis-Honeywell
Montgomery Mfg. Co.
Newmatic Corp.
Paragon Electric
Perfex Corp.
Photovolt Corp.
Precision Products, Inc.
Richardson-Allen
Rhodes, Inc., M. H.
Sangamo Electric
Seely Instr. Co.
Soreng Products
Square D Co.
States Co.
Stoelting Co.
Stromberg Time Corp.
Thomas Clock
Thompson Clock
Tork Clock
Ulanet Co.
Walker-Jamieson
Walser Automatic Timer
Ward Leonard Electric
Westinghouse Electric
Wilson & Co.
Yellow Springs Instr.
Zenith Electric

SWITCHES, Vacuum

Barksdale Valves
Bendix, Eclipse-Pioneer
Bristol Co.
Century Electronics
Colvin Labs.
Cook Electric
Dietz Co., Henry G.
Dwyer Mfg. Co., F. W.
Ebert Electronics
Eitel-McCullough
General Controls Co.
GE, Apparatus Sales
GE, Tube Dept.
Hetherington, Inc.
Jennings Radio Mfg. Corp.
Mack Electric Devices
Mercoid Corp.
Pioneer Electronics
Scaico Controls
United Electric Controls

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also Electromechanical
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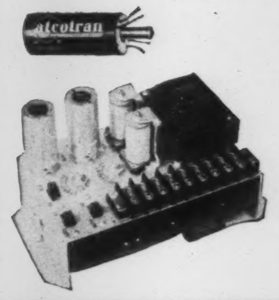
Bendix, Eclipse-Pioneer
Cedar Engrg. Co.
Clifton Prec. Prods.



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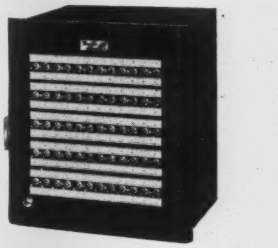
ELECTRONIC PRECISION SWITCH

For more information circle **349** on inquiry card.



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for ALL Types

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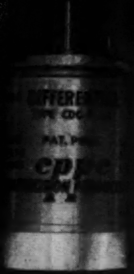
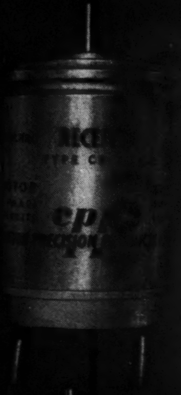


STANDARD UNITS		ROTOR						STATOR					
SYNCHRO FUNCTION	CPPC TYPE	Input V. 400cy	Input Amps.	Input Watts	Ohms (DC)	Output Rotor	Sensitivity (MV/deg.)	Output Volts	Sensitivity (MV/deg.)	Input Volts	Input Amps.	Input Watts	Ohms (DC)
Torque Transmitter	CGC-8-A-7	26	.100	.5	37	—	—	11.8	200	—	—	—	12
Control Transformer	CTC-8-A-1	26	.050	.25	143	24	410	11.8	200	11.8	.090	.23	25
Control Transformer	CTC-8-A-4	—	—	—	381	24	410	—	—	11.8	.037	.09	60
Control Differential	CDC-8-A-1	—	—	—	36	11.8	200	—	—	11.8	.085	.21	25
Electrical Resolver	CSC-8-A-1	26	.039	.43	230	23.2	400	10.6	180	11.8	.084	.27	27
Torque Receiver	CRC-8-A-1	26	.100	.50	37	—	—	11.8	200	—	—	—	12

SIZE 10

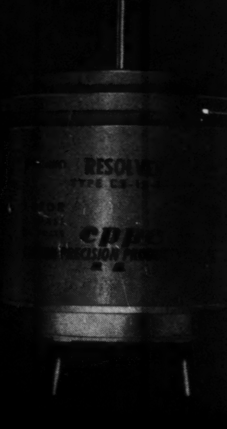
STANDARD UNITS		ROTOR						STATOR					
SYNCHRO FUNCTION	CPPC TYPE	Input V. 400cy	Input Amps.	Input Watts	Ohms (DC)	Output Rotor	Sensitivity (MV/deg.)	Output Volts	Sensitivity (MV/deg.)	Input Volts	Input Amps.	Input Watts	Ohms (DC)
Torque Transmitter	CGC-10-AS-4	26	.160	.71	17.5	—	—	11.8	200	—	—	—	7.5
Control Transformer	CTC-10-AS-1	26			135	26.0	450	11.8	200	11.8	.081	.18	25
Control Transformer	CTC-10-AS-4	—	—	—	99	23.0	400	—	—	11.8	.022	.062	550
Control Differential	CDC-10-AS-1	—	—	—	35	10.8	195	—	—	11.8	.080	.23	25
Torque Receiver	CRC-10-AS-1	26	.088	.44	34	—	—	11.8	200	(11.8 V. Transmitting Stator)			12
Electrical Resolver	CSC-10-AS-1	1-26	.037	.38	220	21.0	365	11.2	195	11.8	.074	.22	28.5
Vector Resolver	CVC-10-AS-1	1-26	.055	.32	70	—	—	11.8	200	11.8			28
Vector Resolver	CWC-10-AS-1	1-26	.040	.28	111	21.0	365	11.8	200	11.8	.080	.26	28

SIZE 11



STANDARD UNITS		ROTOR						STATOR					
SYNCHRO FUNCTION	CPPC TYPE	Input V. 400cy	Input Amps.	Input Watts	Ohms (DC)	Output Rotor	Sensitivity (MV/deg.)	Output Volts	Sensitivity (MV/deg.)	Input Volts	Input Amps.	Input Watts	Ohms (DC)
Torque Transmitter	CG-11-B-2	26	.170	.71	11	—	—	11.8	200	—	—	—	3.8
Control Transmitter	CG-11-B-7	26	.085	.33	20	—	—	11.8	200	—	—	—	8.5
Torque Transmitter	CG-11-B-6	115	.042	.71	180	—	—	11.8	200	—	—	—	3.8
Control Transformer	CT-11-B-2	26			46.5	23	400			11.8	.140	.30	8.6
Control Transformer	CT-11-B-8	—	—	—	47	23	400	—	—	11.8	.098	.18	13
Control Transformer	CT-11-E-7	—	—	—	185	23	400	—	—	11.8	.036	.08	34
Control Differential	CD-11-B-2	—	—	—	12	11.8	200	—	—	11.8	.150	.38	8.5
Torque Receiver	CR-11-B-2	26	.100	.43	20	—	—	11.8	200	(11.8 V. Transmitting Stator)			7.5
Electrical Resolver	CS-11-B-2	1-26	.050	.33	75	23.5	405	12.6	220	12.6	.094	.26	14
Vector Resolver	CV-11-B-2	3	.730	.55	.7	3.2	55	23.4	410	26	.100	.36	18

SIZE 15



STANDARD UNITS		ROTOR						STATOR					
SYNCHRO FUNCTION	CPPC TYPE	Input V. 400cy	Input Amps.	Input Watts	Ohms (DC)	Output Rotor	Sensitivity (MV/deg.)	Output Volts	Sensitivity (MV/deg.)	Input Volts	Input Amps.	Input Watts	Ohms (DC)
Torque Transmitter	CG-15-D-1	26	.225	.8	6.4	—	—	11.8	200	—	—	—	3.2
Torque Transmitter	15CX4a	115	.067	.7	65	—	—	90	1560	(This Unit Weighs 174 gms.)			161
Torque Transmitter	CG-15-MS-1	115	.067	.7	65	—	—	90	1560	(This Unit Weighs 174 gms.)			161
Control Transmitter	CG-15-D-4	26	.100	.4	16	—	—	11.8	200	—	—	—	6.0
Control Transformer	CT-15-D-1	26	.055	.23	37	23.9	410	11.4	195	11.8	.125	.24	10
Control Transformer	CT-15-D-4	—	—	—	180	23.0	400	—	—	11.8	.032	.06	37
Control Differential	CD-15-D-1	—	—	—	19	10.8	195	—	—	11.8	.125	.22	10
Torque Receiver	CR-15-D-1	26	.100	.36	16	—	—	11.8	200	(11.8 V. Transmitting Stator)			6
Electrical Resolver	CS-15-D-1	1-26	.055	.31	74	23	400	11.8	200	11.8	.110	.25	13
Vector Resolver	CW-15-D-1	1-32	.005	.03	540	28.4	495	15	260	15	.010	.03	56

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IMPEDANCE

Ohms (DC)	Zro	Zso	Zrss	Phase Shift R-S	Phase Shift S-R	Nulls (MV)	Possible Error	Possible Spd.	Length in inches
12	54+j260	12+j45	76.4+j19.6	8°	—	30	7′	14′	1.240
25	220+j740	28+j110	246+j60		8.5°	30	7′	14′	1.240
60	508+j1680	67+j270	640+j190	—	9.2°	30	7′	14′	1.240
25	38+j122	27+j120	48.6+j13.8	—	9°	30	7′	14′	1.240
27	280+j600	38+j136	70+j136	20°	11°	30	7′	14′	1.240
12	54+j260	12+j45	85.1+j20.4	8°	—	30	30′	30′	1.240

IMPEDANCE

hms DC)	Zro	Zso	Zrss	Phase Shift R-S	Phase Shift S-R	Nulls (MV)	Possible Error	Possible Spd.	Length in inches
7.5	29+j165	7.6+j28	47+j16	5.8°	—	30	12′	12′	1.241
5	206+j756	28+j122	234+j81		8.5°	30	15′	15′	1.241
0	910+j2770	126+j448	945+j325	—	9.0°	30	15′	15′	1.241
5	52+j152	38+j115	57+j17	—	9.2°	30	10′	15′	1.281
2	57+j289	13+j49	80+j27	5.2°	—	30	30′	30′	1.241
8.5	262+j650	39+j156	308+j71	18.4°	10.5°	1MV/V	15′	15′	1.281
8	109+j460	39+j108	170+j59	8.1°	14.2°	1MV/V	15′	15′	1.241
8	177+j625	91+j143	215+j70		10.4°	1MV/V	15′	15′	1.241

IMPEDANCE

ms C)	Zro	Zso	Zrss	Phase Shift R-S	Phase Shift S-R	Nulls (MV)	Possible Error	Possible Spd.	Length in inches
.8	24+j147	5+j24	27.8+j13.6	3.9°	—	30	12′	12′	1.600
.5	48+j313	12+j55	484+j225	2.5°	—	30	12′	12′	1.600
.8	405+j2700	5+j24	49.6+j21	3.4°	—	100	12′	12′	1.600
.6	97+j422	15+j71	81+j40		4.9°	30	12′	12′	1.600
	100+j620	19+j100		—	5°	30	12′	12′	1.600
	390+j1650	60+j275	320+j163	—	5.5°	30	12′	12′	1.600
.5	14+j67	17+j66	62+j27.6	—	5°	30	10′	12′	1.640
.5	40+j260	10+j40	49.8+j21	4°	—	30	30′	30′	1.600
	130+j500	28+j130	126+j43	8°	8°	1MV/V	12′	12′	1.640
	1+j4	36+j260		9.5°	4°		12′	12′	1.600

IMPEDANCE

s	Zro	Zso	Zrss	Phase Shift R-S	Phase Shift S-R	Nulls (MV)	Possible Error	Possible Spd.	Length in inches
2	14+j110	4+j18	28+j11	3°	—	30	10′	10′	1.600
	163+j1690	175+j894		2.25°	13.5°	125	12′	24′	2.0
	163+j1690	175+j894		2.25°	13.5°	75	10′	10′	2.0
	36+j270	8+j44	40+j23.1	3.5°		30	10′	10′	1.600
	80+j490	15+j80	74+j50	4°	4.5°	30	10′	10′	1.600
	360+j1870	63+j320	338+j203	—	4.5°	30	10′	10′	1.600
	22+j80	15+j80	27+j13	—	5°	30	10′	10′	1.640
	[illegible]+j270	8+j44	40+j23.1	3.5°	—	—	30′	30′	1.600
	110+j520	23+j120		7.5°	5°	1MV/V	10′	10′	1.640
	1100+j6300	300+j1600	1181+j602		5.5°	1MV/V	10′	10′	1.600

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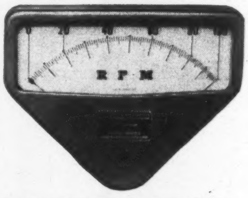

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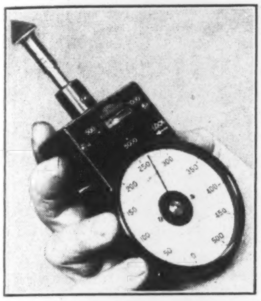

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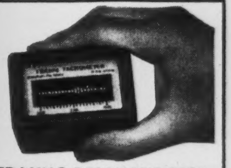
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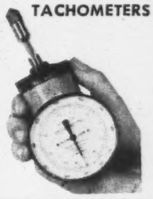

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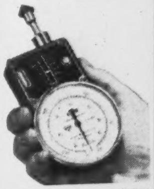

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Sticht Co., Herman H.
WacLine, Inc.
Wang Labs.. Inc.
Westberg Mfg. Co.
Weston Electcl. Instr.
Zernickow Co.

TACHOMETERS, Stroboscopic

Associated Research
Berkshire Labs.
Boulin Instr. Corp.
Clarke Instr. Corp.
Computer Co. of Amer.
Davenport Mfg. Co.
Electronic Measmts. Co.
Fruengel Inc., Frank
GE, Apparatus Sales
General Radio Co.
I-L-S Instr. Corp.
Internatl. Res. & Devel.
Mercury Electronic Co.
Opad Electric
Standard Elect. Time
Stewart-Warner

TACHOMETERS Vibrating Reed

Aero Instr. Co.
Biddle Co., James G.
J-B-T Instruments
Sticht Co , Herman H.
Testing Machines, Inc.
WacLine, Inc.

TACHOSCOPES

Amthor Testing
Biddle Co., James G.
I-L-S Instr. Corp.
Lafayette Instr. Co.
Scherr Co., Inc.
Sticht Co., Herman H.
Zernickow Co.

TAFFRAIL LOGS, Ship, see Marine Instruments

TALC

Baker Chem. Co., J. T.
Berkshire Chemicals
General Ceramics
Harshaw Chemical Co.
Rhodes & Co.
Superior Steatite
Wagner Co., Inc., C. A.
Whittaker, Clark & Daniels

TANTALUM, see Precious Metals

TAPE, Magnetic Recording

Amer. Silver Co.
Davies Labs.
Electronic Mechanics
Logistics Research
Minnesota Mining & Mfg.
Permo, Inc.
Polymer Corp. of Amer.
Reeves Soundcraft

TAPE RECORDERS, see Recorders, Magnetic Tape

TAPE STRETCHER APPARATUS

Testing Machines, Inc.

TAPES, Oil Gager's

Dietzgen Co.
Keuffel & Esser
Lufkin Rule Co.
Shand & Jurs
Starrett Co., L. S.
White Co., David

TAPES, Steel (see also Dimensional Gages)

Bruning Co., Inc.
Dietzgen Co.
Graf-Apsco
Gurley, W. & L. E.
Kueffel & Esser
Lufkin Rule Co.
Speidel & Co.
Starrett Co., L. S.
United States Blue Print
Warren-Knight Co.
Weber Co.
White Co., David

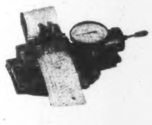
TAPES, Surveyor's, see Surveying Instruments

TAPS, Metric

Amer. Laubscher
Automatic Methods
Bayside Watch Tool
DoAll Co.
Engis Equipment Co.
Ferner Co.
Fineisen, A. R.
Gallien, R. P.
Howard Clock Products
Hy-Pro Tool Co
Jarvis Co., Chas.
Landis Mach. Co.
Morris Co., J. I.
Pratt & Whitney
Sphinx American Co.
Waltham Screw Co.
Woodruff & Stokes

O-Z TACHOMETERS

Precision Centrifugal and Chronometric Types



MODELS WITH ONE, TWO, THREE OR FIVE
RANGES FOR ALL SPEEDS 0-50,000 RPM
PORTABLE AND STATIONARY
Send for Circulars
EXPERT REPAIR SERVICE—ALL MAKES
TACHOGRAPHS — INDICATORS

TACHOMETERS ◆ TACHOSCOPES

O. ZERNICKOW CO.
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For more information circle **354** on inquiry card.

BOULIN
INSTRUMENT
CORPORATION

◆

STROBOSCOPIC TACHOMETER

CHRONOMETRIC TACHOMETER

CENTRIFUGAL TACHOMETER

WIRE & YARN TENSIOMETER

◆

65 Madison Ave.
New York 16, N. Y.

For more information circle **356** on inquiry card.

Edcliff INSTRUMENTS

.... for TELEMETRY and CONTROL

POTENTIOMETER TRANSDUCERS

LINEAR POTENTIOMETERS
Single or multiple elements with resistance values to customer specifications. Direct coupling renders accuracy to better than .001%.

PITCH-YAW INDICATORS
True pitch-yaw indication with better than 0.1° accuracy, depending upon resistance. High temperature components enable use at high mach numbers.

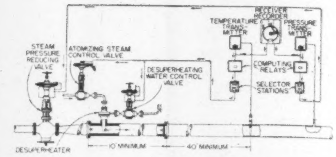
LINEAR MOTION ACCELEROMETERS
High overall accuracy with minimum crosstalk error. Ranges from .025G through 100G, with resistance values up to 20,000 ohms.

MINIATURE PRESSURE TRANSDUCERS
A one-inch cube with the accuracy of larger units! Pressure applied to a miniature element proportionately actuates the brush of a precision potentiometer. High sensitivity and accuracy obtained by elimination of all movement amplification and maintenance of high resolution.

PENDULUM INDICATORS
Precision indication of single axis rotation.

Edcliff INSTRUMENTS
1711 S. MOUNTAIN AVE.
DUARTE, CALIFORNIA

For more information circle **357** on inquiry card.



BAILEY DESUPERHEATING & PRESSURE REDUCING CONTROL

- The control system is air-operated and is arranged to automatically maintain the desired final steam temperature by controlling the quantity of the water fed to the Desuperheater.

Uses standard Bailey components for the measurement and control of both temperature and pressure. The temperature measurement is accomplished by using a closed, helium gas-filled system as illustrated or it may be electrically measured by using a Temperature Resistance Element.

The Desuperheating Water Control Valve and the Steam Pressure Reducing Valve are equipped with Bailey Positioning Relays.

Steam temperature and steam pressure are both recorded on the same 12 in. circular chart. Two additional records or two controllers may also be included in the same case if desired.

Request Product Specification M55-1

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For more information circle **359** on inquiry card..

wiancko
for
DYNAMIC MEASURING EQUIPMENT

- packaged instrumentation systems: analog—digital—airborne
- guidance and control components
- telemetering
- acceleration
- pressure
- position
- force

WIANCKO ENGINEERING COMPANY
255 North Halstead Avenue
Pasadena, California

For more information circle **358** on inquiry card.

TAPS, Special

Amer, Laubscher
Continental Screw
DoAll Co.
Engis Equipment Co.
Fineisen, A. R.
Gallien, R. P.
Hamilton Watch
Hy-Pro Tool Co.
Jerpbak-Bayless
Landis Mach. Co.
Morris Co., J. I.
Pratt & Whitney
Sphinx American Co.
Waltham Screw Co.
Woodruff & Stokes

TAXI METERS

Rockwell Mfg. Co.

TELEGRAPHY, Automatic, including Reperforators, Tape Perforators, Tape Transmitters, Teleprinters, Teletypers

Bunnell & Co., J. H.
CGS Labs., Inc.
Commercial Controls Corp.
Monroe Calc. Mach. Co.
U. S. Instr. Corp.

TELEGRAPHY EQUIPMENT, including Keys, Switches, etc.

Alden Products
Bunnell & Co., J. H.
CGS Labs, Inc.
General Control Co.
Johnson Co., E. F.

TELEMETERING SYSTEMS, Electrical, including Remote-Control Equipment

A. R. F. Products
Aero Electronics
Air Associates
Airborne Accessories
Aircraft Armaments
AiResearch Mfg.
Airflo Instr. Co.
Amer. Electroneering
Amer. Electronic Labs.
Amer. Kloeckner
Amer. Meter Co.
Amer. Temp. Indic. Co.
Applied Science Corp.
Austin Co.
Authorized Manufacturers
Autom. Control Co.
Autom. Electric
Autom. Switch
Autom. Temp. Control
Automation Products
Autron Engrg., Inc.
Avion Div.
B-I-F Industries
Bailey Meter
Baldwin-Lima-Hamilton
Barber-Colman
Bendix, Eclipse-Pioneer
Bendix-Pacific
Berkeley Div.
Black, Sivalls, & Bryson
Bogue Elect. Mfg. Co.
Bristol Co.
Bristol Engrg.
Bristol Motor Div.
Brooks Rotameter Co.
Brush Electronics
Builders-Providence
Cal-Tronics Corp.
Clark Controller Co.
Clarke Instr. Corp.
Cleveland Fuel Equipt.
Commercial Controls
Computer Co. of Amer.
Computer Control Co.
ConRay Corp.
Consol. Electrodynamics
Control Corp.
Curtiss-Wright
Cutler-Hammer
Datran Engrg. Corp.
Daystrom Instr.
Doelcam Div.
Donner Scientific
Du Mont Labs., Allen B.
Elbert Electronics
Elect. Tachometer Corp.
Electro-Mechanical Res.
Electronic Assocs.
Electronic Control Systems
El Mec Labs.
Engrg. Res. & Devel.
Epsco, Inc.
Esterline-Angus
Farnsworth Electronics
Femco, Inc.
Fielden Instr. Div.
Fischer & Porter Co.
Fisher Governor
Fisher Scientific
Ford Instr. Co.
Foxboro Co.
General Devices Inc.
GE, Apparatus Sales
General Mills
General Precision Lab.
General Regulator
Genzlinger, Inc.
Giannini & Co., G. M.
Giannini Datex Div.
Gurley, W. & L. E.
H & H Thermostats
Hagan Corp.
Hallikainen Instruments
Hammarlund Mfg.
Hammel-Dahl
Hathaway Instr. Co.
Hays Corp.
Healy-Ruff Co.
Helipot Div.
Hillyer Instr. Co.
Hoover Electronics Co.
Humphrey, Inc.
Hupp Electronics
Hycon Electronics
Hycon Mfg. Co.
Indikon Co.
Indust. Engrg. Corp.
Industrial Gauges
Insco Co.
Instr. Devel. Labs.
Instr. Devel. & Mfg. Corp.
Instr. Components, Inc.
Instruments Corp.
Instruments Inc.
Internat. Gauges
Internat. Std. Trading Corp.
Jacobs Instruments
Jordan Regulator
Kaye Devel.
Kearfott Co.
Kellogg Switchboard
Kollsman Instr. Corp.
Kybernetes Corp.
L. A. B. Corp.
Landis & Gyr
L & O Research Devel.
Landis & Gyr
Larson Instr. Co.
Lear, Inc.
Ledeen Mfg.
Leeds & Northrup
Lenkurt Electric
Leupold & Stevens
Loral Electronics
Machinery Electrification
Magnetic Amplifiers Inc.
Magnetic Instr. Co.
Magnetic Research Corp.
Manning, Maxwell & Moore
Martin-Hubbard Corp.
Mason-Neilan Div.
Metrotype Corp.
Mid-Century Instrumatic
Minneapolis-Honeywell
Moisture Register Co.
Moore Products
Natl. Aircraft Corp.
Nelson Inst. Co.
Nems-Clarke, Inc.
Norden-Ketay Corp.
North American Insts.
North Electric Co.
Nuclear Corp. of Amer.
Nuclear Research
Olympic Development
Opplem Co.
Pacific Div.
Pacific Scientific
Panellit, Inc.
Panoramic Radio Co.
Parsons Co., Ralph M.
Penn Insts. Co.
Phebco, Inc.
Physical Research
Pioneer Instrument
Polarad Electronics
Post Machinery Co.

Telemeter

ANY VARIABLE from Remote Points!

Accurate
HIGH-SPEED
Continuous
for
POWER
PRESSURE
HUMIDITY
POSITION
VOLTS
SPEED, ETC.

Telemeter transmitter converts DC mv from thermal converters, etc. to 10-30 cps which frequency modulates an audio tone channel. Receiver detects and demodulates transmitted signal, generating a DC mv for operation of recorders or indicating instruments. Up to 45 telemeters can be multiplexed. Any communication link, including power line carrier, may be used. Overall accuracy is 1% with a response speed of 1 sec.

Other terminals for teletype, voice-plus-control & data transmission are available.

Write for Technical and Application Data.

Radio Frequency
LABORATORIES, INC.
Boonton, New Jersey, U. S. A.

For more information circle **360** on inquiry card.

Powers Regulator
Radiation Inc.
Radio Frequency Labs.
Rahm Instruments
Ram Meter, Inc.
Ramo-Wooldridge
Rea Co., J. B.
Relay Service Co.
Republic Flow Meters
Research Controls
Revere Corp.
Roy Co., Milton
Rust Industrial Co.
Schaevitz Engrg.
Schuttig & Co.
Scient. Instr. Co.
Scient. Specialties
Servo Corp. of Amer.
Servo-Tek Products
Servomechanisms, Inc.
Shand & Jurs
Shepard Labs.
Sherron Metallic
Simmonds Aerocessories
Simplex Valve & Meter
Sparton Cont. Systems
Sperry Sun Well Survey
Squires Co.
Statham Labs.
Sterling Prec. Instr. Co.
Stewart Corp.
Streeter Amet
Summers Gyroscope
Swartwout Co.
Sweets Co., Martin
Tabor Instr. Corp.
Taller & Cooper
Tele-Dynamics
Telechrome, Inc.
Teleflex, Inc.
Transval Engrg. Corp.
Trimount Instr. Co.
Vapor Recovery Systems Co.
Victory Engrg. Corp.
Viking Instruments
Virginia Electronics
WacLine, Inc.
Webb Co., Jervis C.
Western Gear
Westinghouse Electric
Westronics, Inc.
Wheelco Div.
Wiancko Engrg. Co.
Wilson & Co.
Yardeny Engineering
Zenith Electrical

TELEMETERING SYSTEMS, Pneumatic

Amer. Meter Co.
Askania Reg. Co.
Autom. Control Co.
Autom. Temp. Control
B-I-F Industries
Bailey Meter Co.
Bristol Co.
Brooks Rotameter Co.
Builders-Providence
Conoflow Corp.
Emery Co., A. H.
Farris Engrg. Corp.
Fielden Instr. Div.
Fischer & Porter Co.
Foxboro Co.
Hagan Corp.
Haydon Co., A. W.
Hoover Electronics Co.
Manning, Maxwell & Moore
Mason-Neilan Div.
Minneapolis-Honeywell
Moore Products
Penn Instr. Div.
Republic Flow Meters
Roy Co., Milton
Sangamo Electric
Scient. Instr. Co.
Simplex Valve & Meter Co.
Servo Corp. of America
Sterling Prec. Instr. Corp.
Taller & Cooper
Taylor Instr. Cos.

TELEMETERING SYSTEMS, RF, including Microwave, Radio Remote Control

Air Associates
Amer. Meter Co.
Arnoux Corp.
Bendix-Pacific
Berkeley Div.
Bristol Co.
Collins Radio Co.
Daystrom Instrument
Electro-Mechanical Res.
Farnsworth Electronics
Ford Instr. Co.
Goodyear Aircraft
Hoover Electronics Co.
Leupold & Stevens
Mid-Century Instrumatic
Natl. Aircraft Corp.
Nems-Clarke, Inc.
Nuclear Corp. of Amer.
Parsons Co., Ralph M.
Radiation Inc.
Ramo-Wooldridge
Rheem Mfg. Co.
Simplex Valve & Meter Co.
Slip Ring Co. of Amer.
Sparton Cont. Systems
Stavid Engrg., Inc.
Sterling Prec. Instr. Corp.
Taller & Cooper
Tele-Dynamics
Texas Insts., Inc.
Transval Engrg. Corp.
United Electrodynamics
WacLine, Inc.

TELEMETERS, Surveying and Military, Optical

Air Associates
Applied Science Corp.
Bronoptics Co.
Bendix-Pacific
Computer Co. of Amer.
Electro-Mechanical Res.
Farnsworth Electronics
Kollmorgen Optical
Keuffel & Esser
Meyer-Opticraft
Pierce Watch Co.
Stavid Engrg., Inc.
Taller & Cooper
Wild Heerbrugg Insts.

TELEPHONE EQUIPMENT, including Telephones, Telephone Test Sets (see also Switchboards)

Autom. Elect. Co.
Autom. Elect. Sales Corp.
Berkeley Div.
Bradshaw Instruments
Cook Electric
Daven Co.
Electronic Development
Federal Telegraph Co.
GE
General Electronic
Gray Instr. Co.
Henschel Corp.
Instrument Laboratories
Internat. Std. Trading Corp.
Kellogg Switchboard
North Electric Co.
Rubicon Co.
Shallcross Mfg. Co.
Sherron Metallic
Sierra Electronic Corp.
Supreme, Inc.
Sure Brothers
Tarc Electronics
Technology Instr. Div.
U. S. Instr. Corp.
Wheeler Insul. Wire, Inc.

TELESCOPES, Alignment

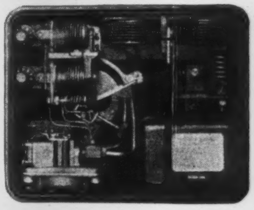
Acme Industrial
Align-A-Scope Inc.
Amer. Cystoscope Makers
Amer. Optical
Aremac Assocs.
Bray Optical
Bronoptics Co.
Buhl Optical
Davidson Mfg. Co.
Edmund Scientific
Engis Equipt. Co.
Ercona Corp.
Farrand Optical
Fecker, Inc., J. W.
Gaertner Scientific
Griswold Mfg. Co.
Gurley, W. & L. E.
Helio Instr. Co.
Hirschmann Co., Carl
Howland Optical
Internat. Devel. Co.
Kueffel & Esser
Kollmorgen Optical
Lab. Optical Co.
Los Angeles Scient.
Mann Co., W. I.
Meyer-Opticraft
Opplem Co., Inc.
Optical Serv. & Devel.
Palos Optical
Pan-technics, Ltd.
Penn Optical & Instr.
Perkin-Elmer
Plummer & Kershaw
Rudolph & Sons, O. C.
Scherr Optical Tools
Stratex Instr. Co.
Testa Mfg. Co.
Tinsley Labs.
Unertl Optical
Warren-Knight
White Co., Inc., David
Zeiss, Inc., Carl

TELESCOPES, Astronomical

Askania-Werke A. G.
Bausch & Lomb
Berger & Sons
Bray Optical
Bronoptics Co.
Buchele, W.
Bushnell Optical
Clark & Sons
Eastern Science Co.
Edmund Scientific
Ercona Corp.
E & S Optical
E & W Optical
Fecker, Inc., J. W.
Gaertner Scientific
Gordon Enterprises
Helio Instr. Co.
Henson Co., Fred C.
Internat. Devel. Co.
Lab. Optical Co.
Mann Co., W. I.
Mico Instrument Co.
Opplem Co., Inc.
Palos Optical Co.
Pan-technics, Ltd.
Pancro Mirrors, Inc.
Penn Optical & Instr.
Perkin-Elmer
Plummer & Kershaw
Testa Mfg. Co.
Tinsley Labs.
United Scientific
Unertl Optical
White Co.
Zeiss, Inc., Carl

TELESCOPES, Azimuth and/or Zenith

Align-A-Scope
Amer. Cystoscope Makers
American Optical
Askania-Werke A. G.
Bray Optical
Bronoptics Co.
Bushnell Optical
Clark & Sons
Davidson Mfg. Co.
Edmund Scientific
E & S Optical
Ercona Corp.
Esco Products
Fecker, Inc., J. W.



BAILEY

COMPUTING RELAY

- Receives pneumatic signals from transmitters, controllers, and/or relays and produces a control signal according to the computing or control action desired.

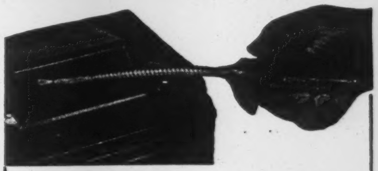
As a computer it can multiply, divide, reverse, subtract, average, or totalize pneumatic signals.

As a controller it provides the following control actions: Proportional; Proportional plus Reset; Proportional plus Rate; Proportional plus Reset plus Rate; and Floating (Reset only).

Request Product Specification P99-3.

BAILEY METER COMPANY
1041 IVANHOE ROAD CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

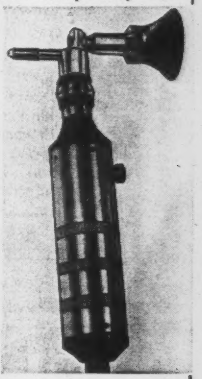
For more information circle **362** on inquiry card.



THE EDER LIGHT

Speeds inspection of hard-to-get-at-places

Delivers light where you need it . . . thru a hole, around a corner or in a deep grove. Adjusts to any angle. Slender lamp only 1/8" diameter. 10x Magnifier and right angle mirror attachments.



New
INSPECTION TELESCOPE

Inspect sides and bottoms of blind holes only 1/16" diameter. 5X Magnification at 2" distance shows sharp detail of threads, machining, casting interiors, etc.

Write for folder 1-10

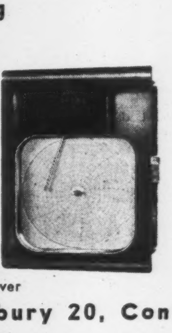
EDER INSTRUMENT CO.
2293 N. CLYBOURN AVE. CHICAGO, ILL.

For more information circle **363** on inquiry card.

Bristol's® Metameter® Telemeters

for remote measurement, indicating, recording and automatic control

Bristol's Metameter Telemeters measure pressure, flow, temperature, liquid level, motion and gate position, voltage, current, power, totalized power load, and reactive volt-amperes at remote points from a few feet to many miles away. Very wide choice of transmitting media: carrier channel, telephone, private wires, radio beam (microwave, VHF, and UHF), multiplexing and selective calling—or any convenient circuit you may select. Many electric and electronic instruments (round- and strip-chart) available. Write for Bulletin M1710.



Series 500 Receiver

BRISTOL COMPANY
112 Bristol Rd., Waterbury 20, Conn.

For more information circle **361** on inquiry card.

GPL *ii-TV* camera with remote control of iris aperture and lens optical focus. Vernier control of focus regardless of lens focal length. Nylon gear drives give quiet, positive action; local control of camera also available.

Mounted for indoor use with remote control of pan and tilt, GPL *ii-TV* camera provides 360° camera viewing and 90° tilt. Position accurately indicated on control box.

Outdoor unit; weatherproof under all conditions; permits full 360° camera viewing, 90° tilt. Heavy-duty remote pan and tilt unit equipped with solenoid brakes to prevent drift, regardless of wind velocity.

Complete Remote Control with GPL *ii-TV*®

GPL's *industrial-institutional* closed-circuit TV system

There's *ii-TV* closed-circuit equipment to fit every industrial "seeing" problem. And GPL's skilled application engineers will be glad to help you select the system best suited to your need.

GPL *ii-TV* is designed, built and engineered by men who have the highly specialized skills required to produce top quality equipment. Every piece in the *ii-TV* System reflects GPL's extensive experience in the production of high performance television systems to meet the rigid standards of the Armed Services and broadcasting studios.

Investigate the bright, clear picture, rugged construction, dependability and all-around economy of the outstanding GPL *ii-TV* System. Compare—and you'll see that nothing is more economical than the best.

Dangerous processes of any kind can be closely controlled in complete safety with GPL *ii-TV*. System's remote control features are equally effective in countless other industrial applications.

For further information, or application engineering assistance, write or contact:

GPL GENERAL PRECISION LABORATORY INCORPORATED
PLEASANTVILLE, NEW YORK

A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

For more information circle 364 on inquiry card.

Gaertner Scientific
Gurley, W. & L. E.
Gordon Enterprises
Helio Instr. Co.
Internat. Devel. Co.
Kollmorgen Optical
Lab. Optical Co.
Mann Co., W. I.
Palos Optical
Pan-technics, Ltd.
Penn Optical & Instr.
Perkin-Elmer
Plummer & Kershaw
Testa Mfg. Co.
Tinsley Labs.
Unertl Optical
Warren-Knight
Warner & Swasey
White Co., David
Zeiss, Inc., Carl

TELESCOPES, Bore and Internal Surface, Inspection

Acme Scientific
Amer. Cystoscope Makers
American Optical
Amer. Instr. Co.
Ames Co., B. C.
Bray Optical
Bronoptics Co.
Buhl Optical
Commercial Optical
Comtor Co.
Eder Instr. Co.
Edmund Scientific
Engis Equipt. Co.
Epic, Inc.
Farrand Optical Co.
Fecker, Inc., J. W.
Federal Products
Gaertner Scientific
Gordon Enterprises
Helio Instr. Co.
Hirschmann Co., Carl
Internat. Devel. Co.
Jerpbak-Bayless
Kollmorgen Optical
Lab. Optical Co.
Leitz, Inc.
Lenox Instr. Co.
Magnaflux Corp.
Mann Co., W. I.
Meyer-Opticraft
National Electric
Pan-technics, Ltd.
Perkin-Elmer
Plummer & Kershaw
Scherr Optical Tools
Schneider-Cogswell
Swedish Gage Co.
Testa Mfg. Co.
Tinsley Labs.
Topp Industries, Inc.
Unertl Optical
United Scientific
Welch Allyn, Inc.
White Co., Inc., David
Zeiss, Inc., Carl

TELESCOPES, Laboratory

Align-A-Scope Inc.
Amer. Cystoscope Makers
American Optical
Ann Arbor Instr. Wks.
Askania-Werke A. G.
Bausch & Lomb
Bray Optical
Bronoptics Co.
Buhl Optical
Bushnell Optical
Central Scientific
Davidson Mfg. Co.
Eberbach & Son
Edmund Scientific
Fecker, Inc., J. W.
Gaertner Scientific
Gurley, W. & L. E.
Helio Instr. Co.
Henson Co., Fred C.
Internat. Devel. Co.
Lab. Optical Co.
Los Angeles Scient.
Lynn, Robert M.
Mann Co., W. I.
Meyer-Opticraft
Opplem Co., Inc.
Optical Ser. & Devel.
Palos Optical
Pan-technics, Ltd.
Penn Optical & Instr.
Plummer & Kershaw
Precise Measmts. Corp.
Rudolph & Sons, O. C.
Scherr Co., Inc.
Testa Mfg. Co.
Tinsley Labs.
Unertl Optical
Welch Mfg. Co., W. M.
Zoomar Corp.

TELESCOPES, Reflection and/or Refracting

Alfa Amer. Corp.
Align-A-Scope, Inc.
Amer. Cystoscope Makers
Askania-Werke A. G.
Bausch & Lomb
Bray Optical Co.
Bronoptics Co.
Buchele, W.
Bushnell Optical
Clark & Sons
Davidson Mfg. Co.
E & S Optical
Edmund Scientific
Engis Equipt Co.
Ercona Corp.
Esco Products
Fecker, Inc., J. W.
Fish-Schurman
Gaertner Scientific
Gordon Enterprises
Helio Instr. Co.
Henson Co., Fred C.
Howland Optical
Internat. Devel. Co.
Keuffel & Esser
Lab. Optical Co.
Leroy M. E. Clausing
Mann Co., W. I.
Opplem Co., Inc.
Palos Optical
Pancro Mirrors, Inc.
Penn Optical & Instr.
Perkin-Elmer
Plummer & Kershaw
Testa Mfg. Co.
Tinsley Labs.
Unertl Optical
United Scientific
Warner & Swasey
Wollensak Optical
Zeiss, Inc., Carl
Zoomar Corp.

TELEVISION, Industrial

Austin Co.
Berndt-Bach
Cardwell Mfg. Corp.
Dage Television Div.
Diamond Power Spec. Corp.
Du Mont Lab., Allen B.
Eastman Kodak Co.
Farnsworth Electronics
GE, Electronics Div.
Genl. Prec. Lab.
Jacobs Instruments
Jerrold Electronics
Kay Electric
Kay-Lab
Kybernetes Corp.
Norden-Ketay
Perkin-Elmer
Philco Corp.
RCA Div.
Spencer-Kennedy Labs.
Taller & Cooper
Tarc Electronics
Telechrome
Teletronics Laboratory, Inc.
Zoomar Corp.

TEMPERATURE ALARM SYSTEMS (see also Monitors)

Arnoux Corp.
Assembly Products
Autom. Contr. Co.
Autron Engrg., Inc.
B-I-F Industries
Barber-Colman Co.
Bendix-Pacific
Bristol Co.
Chatham Conts. Corp.
Colortone Electronics
Cooper Co., Clark
Davenport Mfg. Co.
Edison, Inc., Thomas A.
Edwards, L. V.
Electro Devices, Inc.
Farnsworth Electronics
Fielden Instr. Div.
Fischer & Porter Co.
Fulton Sylphon Div.
H-B Instr. Co.
Hallikainen Insts.
Henschel Corp.
Illinois Testing Labs.
Indikon Co.
Kybernetes Corp.
Minneapolis-Honeywell Indust. Div.
Moeller Instr Co.
Panellit, Inc.
Photobell Co.
Rheem Mfg. Co.
Sciaco Controls
Scam Inst. Co.
Scient. Instr. Co.
Servo Corp. of Amer.
Sparton Cont. Systems
Swift & Anderson Inc.
Taller & Cooper
Tell-Tronics Prods.
Temp. Engrg. Corp.
Tigerman Engrg. Co.
Victroy Engrg. Corp.
Viking Instruments
West Instr. Corp.
Yellow Springs Instr. Co.

TEMPERATURE BOMBS

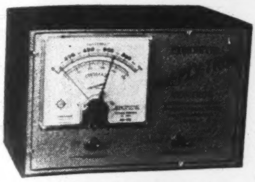
Coleman Instr. Co.
Precision Scientific
Ruska Instr. Corp.
Shand & Jurs
Vapor Recovery Systems

TEMPERATURE CALIBRATION EQUIPMENT (see also Standards, Temperature, also Baths, Calibration)

Aero Res. Instr. Co.
Amer. Instr. Co.
Amer. Research Corp.
Amthor Testing
B & H Instr. Co.
Bacharach Indust. Instr.
Bristol Co.
Ever Ready Thermometer
Farnsworth Electronics
Fielden Instr. Div.
Freas Glass Works
G. M. Mfg. Co.
Gray Instr. Co.
Green, Henry J.
H-B Instr. Co.
Hallikainen Insts.
Harco Labs.
Hiergesell & Sons
Hill & Co., E. Vernon
Howell Instr. Co.
Huddleston, J. S. F.
Internat. Radiant
J-B-T Instruments
Kahl Scientific
Leeds & Northrup
Lewis Engrg. Co.
Modern Lab. Equipt. Co.
Moeller Instr. Co.
Nurnberg Thermometer
Palmer Thermometers
Partlow Corp.
Philadelphia Scientific
Pimex, Inc.
Prec. Thermom. & Instr.
Process & Instruments

CONTROLS

SIMPLYTROL AUTOMATIC TEMPERATURE CONTROL, THERMOCOUPLE-ACTUATED



Compact
Reliable
Simple

Ranges from —400°F. to +3000° F.

Indicating accuracy 2%.

Control accuracy often better than ½%.

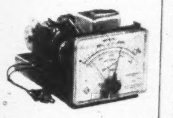
Cat. 4535 0-1000°F. I/C
Approx. 10 x 6 x 7" **$135**

On-off control or automatic shut-down for furnaces, ovens, kilns, etc.

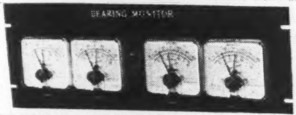
Few moving parts—no vacuum tubes. Regular load relay is SPDT 5 amps. Optional heavy duty relays to 40 amps. Indicating meter-relay is medium high resistance and has bimetal cold junction compensation. For use with all standard thermocouples.

No leveling required—just connect thermocouple, connect load (two or three wire), and plug in to 115 or 230 volt AC line.

OPERATION: Control action starts when the EMF generated by the thermocouple moves the D'Arsonval coil in the meter-relay, and causes a contact carried on the indicating pointer to touch one mounted on the control pointer. This causes a load relay to turn the heat off. Only if the temperature drops below the control point will the load relay drop out to turn the heat on again.



SILHOUETTE
Meter-relay mounts in front of panel, chassis behind.



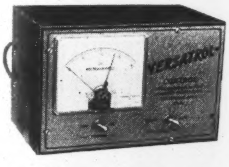
BEARING TEMPERATURE MONITOR

Cat. No. 3590-4 **$355.00**

Meter-relays, operating directly from thermocouples, give immediate warning or shut-down upon dangerous temperature rise in bearings (or other danger points). Any number of points can be monitored.

VERSATROL AUTOMATIC CONTROLS

For any variable than can be measured electrically. Adjustable control points. Automatic operation.



Cat. 3581
Versatrol High Limit Automatic with 451-C Meter-Relay (0-20 Ua DC)
Approx. 10x6x7"
Price **$154.25**

The Versatrol consists of a meter-relay and all additional components for a complete control assembly. Any range or type of meter-relay can be supplied in a Versatrol. Self-contained load relays have 5 ampere contacts. The control point is adjustable from the front—can be set to any place on the meter scale. Meter-relays for Versatrols can be calibrated in "Feet Per Minute" (tachometers), "Foot Candles" (photo cells), "Counts per minute", (Geiger), "Deflection", (Strain gages), "Deviation", (zero center)—and any other function that can be converted to electrical units.

Control can be high limit (on an increase in signal), low limit (on a decrease in signal), or double (control action on rise or fall of signal). Versatrol can be used for continuous on-off control (automatic) or for shut-down or alarm (requiring manual reset). No vacuum tubes are used. Available in wall cabinet, panel mount, "U-Mount-It" etc.

Write for 40 page Catalog 4B.

Assembly Products, Inc., Chesterland 30, Ohio. Phone: (Cleveland, O.) HAmilton 3-4436 (West Coast: Desert Hot Springs 30, Calif. Phone: 4-3133 & 4-2453).

For more information circle **365** on inquiry card.

Std. Electronic Res.
Taylor Instr. Cos.
Technical Equipt. Co.
Technique Assocs.
Temp. Engrg. Corp.
Thermometer Corp.
Thwing-Albert
Wagner & Son
Weston Electcl. Instr.

TEMPERATURE CONTROLLERS (see also Temperature Regulators)

AP Control Corp.
Accuracy Scient. Instr.
Acro Mfg. Co.
AiResearch Mfg. Co.
Allen-Bradley
Alloy Bellows Engrg. Co.
Amer. Gas Furnace Co.
Amer. Instr. Co.
Amer. Temp. Indicating
Askania Reg. Co.
Assembly Products
Atlas Valve Co.
Autom. Temp. Contr. Co.
Autron Engrg., Inc.
B & H Instr. Co.
Bailey Meter Co.
Barber-Colman
Bar-Ray Products
Barnes Engrg. Co.
Bayley Instr. Co.
Bendix-Friez
Betts & Betts
Black, Sivalls & Bryson
Blue M Electric
Boekel & Co.
Boiler Room Equipt.
Braun Corp.
Bristol Co.
Burling Instr. Co.
Cannon Instr. Co.
Carlingo Commodities
Cash Co., A. W.
Century Instr. Co.
Chatham Conts. Corp.
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Commercial Research
Cook Electric Co.
Cooper Co., Clark
Cuthbert Co., Inc.
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Cybertronic Corp.
Dahl Co., Inc., G. W.
Davenport Mfg. Co.
Dickson Co.
Doelcam Div.
Douglass Automatic
Ebert Electronics
Eclipse Fuel Engrg. Co.
Edison Electcl. Controls
Edison Inc., Thomas A.
Electric Hotpack Co.
Electrimatic Corp.
Electro Medical Lab.
Electro-Tech. Equipt.
Electronic Products
Electronics Corp. of Amer.
Elgin Natl. Watch
Emerson Apparatus Co.
Emmett Mach. & Mfg., Inc.
Engelhard, Chas.
Farnsworth Electronics
Farris-Stacon
Fenwal, Inc.
Ferner Co.
Fielden Instr. Div
Fischer & Porter Co.
Fisher Scientific
Fish-Schurman
Foster Engrg. Co.
Fox Valley Instr.
Foxboro Co.
Fuel Watchman
Fulton-Sylphon Div.
G-M Labs.
G-V Controls Inc.
General Controls Co.
GE, Apparatus Sales
GE, Instrument Dept.
Genl. Regulator Corp.
Gleason Avery, Inc.
Gordan Co., Claud S.
Gotham Instr. Div.
H-B Instr. Co.
H-H Thermostats
Hagan Corp.
Hallikainen Insts.
Hammel-Dahl
Hart Mfg. Co.
Hays Corp.
Huppert Co., K. H.
Illinois Testing Labs.
Industrial Control Panel
Indust. Engrg. Corp.
Instrument Rep. & Mfg.
Jaidinger Mfg. Co.
Jelrus Co.
Johnson Service Co.
Jordan Corp.
Jordan Reg. Co.
Kaye & MacDonald
Keckley Co.
Kessler Co.
Kieley & Mueller
Klipfel Valve Div.
Larson Instr. Co.
Leeds & Northrup
Leslie Co.
Lewis-Engrg. Co.
Loudon Insts. Div.
Magnetic Instr. Co.
Manning, Maxwell & Moore
Marsh Corp.
Mason Instr. Co.
Mason-Neilan Div.
McAlear Mfg. Co.
Mercoid Corp.
Minneapolis-Honeywell
  Indust. Div.
Modern Lab. Equipt. Co.
Moeller Instr. Co.
Moisture Register Co.
Moore Products
Mu-Switch Corp.
National Controls
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Partlow Corp.

Write for this catalog
MERCOID CONTROLS
Catalog NO. 856
The Mercoid Corporation

MERCOID® CONTROLS

CONTENTS:

CONTROLS FOR
PRESSURE—
DIFFERENTIAL PRESSURE—
TWO-STAGE PRESSURE—
TEMPERATURE—
TWO-STAGE TEMPERATURE
LIQUID LEVEL
FLOAT OPERATION
LEVER ARM OPERATION

CASE STYLES
TO MEET VARIOUS
REQUIREMENTS
INDOOR
(General Purpose)
OUTDOOR
(Weather Resistant)
HAZARDOUS LOCATIONS
(Explosion-proof)

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Write for Catalog No. 856-G

THE MERCOID CORPORATION
4201 BELMONT AVE., CHICAGO 41, ILLINOIS U.S.A.

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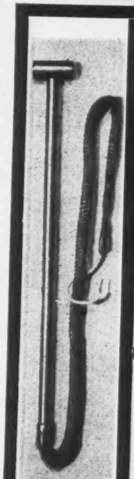
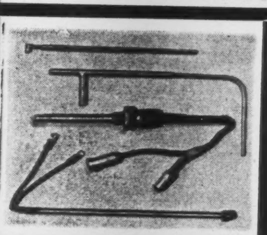
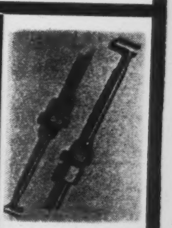


RELIABLE FLOW & TEMPERATURE PICK-UP INSTALLATIONS

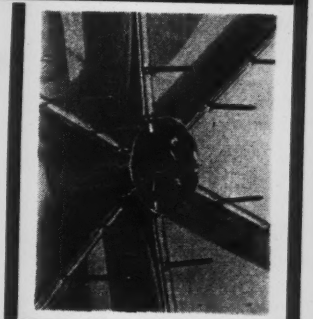




Design Development Test Fabrication

HOT OR COLD

Your test conditions and date requirements guide our specifications.



PROPULSION DEVELOPMENT LABORATORIES
1120 El Segundo Blvd.
El Segundo, California

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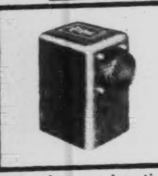
ARNOUX

... is *your* headquarters for

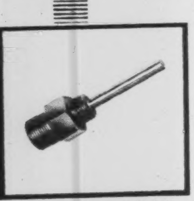
TEMPERATURE INSTRUMENTATION, ACCESSORIES, TRANSDUCERS and SYSTEMS

THERMOCOUPLE REFERENCE JUNCTIONS ...



Operating as a "hot" reference junction, this compact, rugged unit provides constant 250° F. temperature, regulated within 0.75 % throughout MIL-E 5272 A ambients. Models available for 24 v.d.c. or 115 v.a.c. power. Provided with choice of thermocouple materials. Sizes: 2 to 12 channels. Write for Bulletin 400.

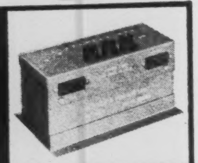
TEMPERATURE PROBES...



Standard high-output probes available with resistances of 100, 1k, 2k, 4k and 20k ohms at 77° F. Available ranges cover —320° F. to 2000° F.

Write for Bulletin 300.

AIRBORNE TEMPERATURE MEASURING SYSTEMS...



Ideal for telemetering, high signal output TME systems provide up to 5 volt signals for as little as 150° F. temperature change without amplification using ARNOUX high-resistance (20,000 ohm) probes. 7 to 20 channels. 115 V-400 cps power. Size: 7" x 4½" x 3½".

Write for Bulletin 500.

Designers and Mfgr's of Precision Instrumentation

ARNOUX CORPORATION

11924 West Washington Blvd.
Los Angeles 66, California

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Penn Insts. Div.
Perfex Controls Div.
Perfex Corp.
Phen-Trols Inc.
Phila. Thermometer Co.
Phoenix Prec. Instr.
Pimex, Inc.
Powers Reg. Co.
Precision Scientific
Precision Thermom.
Preferred Utilities
Pyrometer Instr. Co.
Pyrometer Service Co.
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Refinery Supply Co.
Republic Flow Meters
Research Controls
Revere Corp.
Rheem Mfg. Co.
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Robinette Co., W. C.
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Rockwell Engrg. Co.
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Scientific Glass App.
Scientific Instr. Co.
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Seely Instr. Co.
Servo Corp. of Amer.
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Stevens Mfg. Co.
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Swartwout Co.
Swieco Inc.
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Tell-Tronics Prods.
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Ulanet Co.
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United Electric Controls
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U. S. Gauge Div.
Valverde Labs.
VecTrol Engrg., Inc.
Victory Engrg.
Viking Instruments
Watts Reg. Co.
Weksler Thermom. Corp.
West Instr. Corp.
Weston Electcl. Instr.
Wheelco Instr. Div.
White Mfg. Co.
White-Rodgers
Yellow Springs Instr. Co.

TEMPERATURE INSTRUMENTS, see Thermometers, also Pyrometers

TEMPERATURE REGULATORS, Self Operated

AiResearch Mfg. Co.
Amer. Instr. Co.
Assembly Products
Autron Engrg., Inc.
Bayley Instr. Co.
Blue M Electric
Bristol Co.
Chatham Conts. Corp.
Cooper Co., Clark
Davenport Mfg. Co.
Eclipse Fuel Engrg. Co.
Fielden Instr. Div.
Foster Engrg. Co.
Fulton Sylphon Div.
General Controls Co.
H-B Instr. Co.
Jordan Corp. Div.
Kaye & MacDonald
Keckley Co.
Klipfel Valves
Leslie Co.
Magnetic Research Corp.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
McAlear Mfg. Co.
Minneapolis-Honeywell
  Indust. Div.
Modern Lab. Equipt. Co.
Moeller Instr. Co.
Partlow Corp.
Pimex, Inc.
Powers Reg. Co.
Robertshaw-Fulton
Sarco Co.
Scient. Instr. Co.
Spence Engrg. Co.
Spencer Thermostat Div.
Squires Co., C. E.
Std. Electronic Res.
Taylor Instr. Cos.
Tell-Tronics Prods.
Thermo-Electric Co.
Trerice Co.
United Electric Controls
Watts Reg. Co.
Yellow Springs Instr. Co.

TEMPERATURE SENSITIVE PAINT and CRAYONS

Gordon Co., Claud S.
Tempil Corp.
Tenney Engrg. Co.
Whittaker, Clark & Daniels

TEMPERATURE STANDARDS, see Standards, Temperature

TEMPERATURE TRANSMITTERS, Electrical Output

Arnoux Corp.
Assembly Products
Autron Engrg., Inc.
B-I-F Industries
Bendix, Friez Instr. Div.
Bendix-Pacific
Bristol Co.
Davenport Mfg. Co.
Fielden Instr. Div.
Fischer & Porter Co.
GE, Apparatus Sales
Giannini & Co., G. M.
Hagan Corp.
Hays Corp.
Manning, Maxwell & Moore
Penn Insts. Div.
Rheem Mfg. Co.
Ruge Assocs., Arthur C.
Scientific Instr. Co.
Shand & Jurs
Swartwout Co.
Taylor Instr. Cos.
Trans-Sonics, Inc.
United Control Corp.
VecTrol Engrg., Inc.

TEMPERATURE TRANSMITTERS, Pneumatic Output

B-I-F Industries
Bristol Co.
Burling Instr. Co.
Fischer & Porter Co.
Foxboro Co.
Fulton Sylphon Div.
Hagan Corp.
Leslie Co.
Manning, Maxwell & Moore
Minneapolis-Honeywell
  Indust. Div.
Moore Products
Penn Insts. Div.
Powers Reg. Co.
Republic Flow Meters
Research Controls
Scientific Instr. Co.
Taylor Instr. Cos.
U. S. Gauge Div.

TENDERNESS TESTERS, see Softness Testers

TENSILE TEST MACHINES, see Testing Machines

TENSIOMETERS (See also Surface Tension)

Baldwin-Lima-Hamilton
Boulin Instr. Corp.
Brush Electronics
Central Scientific
Chatillon & Sons
Custom Scientific Insts.
Dillon & Co., W. C.
Eitzen Co., Louis C.
Emery Co., A. H.
Federal Products
GE
Georator Corp.
Gilmore Industries
Instr. Devel. & Mfg. Corp.
Kushner, Joseph B.
Metron Instr. Co.
Millers Falls
Olsen Testing Machine
Pacific Scientific Co.
Refinery Supply Co.
Rutico, Inc.
Saxl Instr. Co.
Schaevitz Engineering
Statham Labs.
Superdraulic Corp.
Suter, Alfred
Telechrome, Inc.
Tensitron, Inc.
Testing Machines, Inc.
Thwing-Albert
Toledo Scale Co.
WacLine, Inc.

TENSION INDICATORS (see also Textile Test Instruments)

Allied Products Div.
Ann Arbor Instr. Works
Askania Werke, A. G.
Baldwin-Lima-Hamilton
Boulin Instr. Co.
Brush Electronics
Chatillon & Sons
Daystrom Instrument
Daytronic Corp.
Dillon Co., W. C.
Eitzen Co., Louis C.
Emery Co., A. H.
Exact Weight Scale Co.
Federal Products
GE
Georator Corp.
Gilmore Industries
Jo-Line Tools
Olsen Testing Mach.
Pacific Scientific
Precision Scientific
Saxl Instr. Co.
Seederer-Kohlbusch
Streeter-Amet
Thwing-Albert
Tensitron, Inc.
Wiancko Engrg. Co.

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Aerovox Corp.
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Akron Porcelain Co.
Alden Products
American Lava Corp.
Armel Electronics
Autom. Electric
Brit. Electronic Sales
Buchanan Electcl. Prods.
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Cinema Engrg. Co.
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Continental-Diamond Fibre
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Hermaseal Co.
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Lenkurt Electric
Lerco Electronics
Lynn Electronic Res.
Miller Dial & Name Plate
Molded Insulation Co.
North Electric
Richardson Co.
Ritchie & Co.
Rogan Brothers
Smith, Inc., Herman H.
Spaulding Fibre Co.
States Co.
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Stokes Molded Prods.
Stupakoff Div.
Superior Steatite
Torwico Electronics
U. S. Engrg. Co.
U. S. Gasket Co.
U. S. Instr. Corp.

TERMINAL BOARDS

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Aicraft Radio Corp.
Alden Products
American Lava Corp.
Amphenol Electronics
Buchanan Electcl. Prods.
Cambridge Thermionic
Cinch Mfg. Co.
Collectron Corp.
Continental Connector
Curtis Devel. & Mfg. Co.
Dimco-Gray
Electronic Mechanics
Excellex Electronics
Formica Co.
GE, Apparatus Sales
Garde Mfg. Co.
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Lerco Electronics
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Molded Insulation
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States Co.
Steatite Div.
Sylvania Electric Prods.
Torwico Electronics
Tri-Dex Electronics
U. S. Engrg. Co.
U. S. Gasket
Vector Electronic
Viking Industries
Virginia Electronics

TERMINAL STRIPS

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Aircraft-Marine Prods.
American Lava Corp.
Amphenol Electronics
Armel Electronics
Autom. Electric
Birnbach Radio Co.
Buchanan Electcl. Prods.
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Cannon Electric
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Sylvania Electric Prods.
Torwico Electronics
Tri-Dex Electronics
U. S. Engrg. Co.
U. S. Instr. Corp.
U. S. Gasket
Vector Electronic
Viking Industries
Virginia Electronics
Waldom Electronics

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American Lava Corp.
Armel Electronics
Bead Chain Mfg. Co.
Birnbach Radio Co.
Brit. Electronics Sales
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Collectron Corp.
Continental Connector
Cook Electric
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Eby, Inc,. Hugh H.
Electric Auto-Lite Co.
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Grayhill
Indust. Hrdw. Mfg. Co.
Lab-Tronics
Lerco Electronics
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Microdot, Inc.
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Revere Corp. of Amer.
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States Co.
Steatite Div.
Stupakoff Div.
Technical Soldering Co.
Thomas & Betts
Torwico Electronics
Triad Transformer
U. S. Gasket Co.
Vaco Products
Vector Electronic
Waldom Electronics
Winchester Electronics

TERMINALS, Hermetic

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Biggs Co., Carl H.
Burndy Engrg. Co.
Centralab
Ceramaseal Co.
Clifford Mfg. Co.
Durakool, Inc.
Electrical Industries
Electronic Mechanics
Farnsworth Electronics
Fish-Schurman
Fusite Corp.
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General Ceramics
Glass Engrg. Co.
Glass-Solder Engineering
Hermaseal Co.
Hermetic Sealed Prods.
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Litton Industries
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Potter & Brumfield
Radiation Counter Labs.
Regal Instr. Co.
Sealtron Corp.
Specialties, Inc.
Steatite Div.
Stupakoff Div.
Sylvania Electric Prods.
Tinnerman Prods.
Torwico Electronics
Triad Transformers Corp.
U. S. Gasket
Winslow Co., Inc.

TEST BLOCKS

Brown & Sharpe
Buchanan Electcl. Prods.
Clarke Instr. Inc.
Detroit Testing Mach.
Eastern Spec. Co.
Eitzen Co., Louis C.
Fish-Schurman
Fonda Gage Co.
GE. Apparatus Sales
Gordon Co., Claud S.
Kent Cliff Labs. Div.
Olsen Testing Mach.
Scherr Co., Inc.
States Co.
Steel City Testing Mach.
Testing Machines. Inc.
Torsion Balance Co.
Van Keuren Co.

TEST BLOCKS, Textile, see Textile Test Instruments

TEST CHAMBERS, see Environmental Test Chambers

TEST SETS, Diode, see Diode Test Sets

TEST STANDS, Propeller, see Propeller

TEST WEIGHTS, see Weights, Avoirdupois Metric or Troy

TESTERS, see the Object of Test, e.g.

Abrasion Testers,
Asphalt Testers,
Battery Testers,
Circuit Testers,
Coil Testers
Flash Point Testers

TESTERS, Air Speed Indicators, see Aircraft Instrument Testers

FOR THE FINEST IN FLOW MEASUREMENT

Specify:
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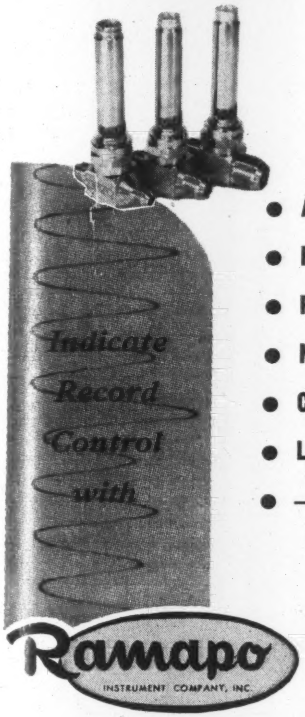
MARK V
FLOW
TRANSDUCER



- ACCURATE
- RUGGED
- FAST RESPONSE
- NO MOVING PARTS
- COMPATIBLE
- LOW SYSTEM COST
- —65° to +300° F

Ramapo
INSTRUMENT COMPANY, INC.

Riverdale, N. J.

For more information circle 369 on inquiry card.

TESTERS, Altimeters, see Aircraft Instrument Testers

TESTERS, Condenser, see Capacitance Indicators (Electrical) or Boiler Room Instruments (Process)

TESTERS, Dead Weight, see Pressure Instrument Calibrators, Dead Weight

TESTERS, Dew Point, see Humidity Instruments

TESTERS, Fuel, see Gas Analyzers, Coal Testers, etc.

TESTERS, Hydrogen-Ion, see pH

TESTERS, Moisture, see Moisture, also Environmental Test

TESTERS, Mullen, see Bursting Testers

TESTERS, Non-destructive, Electrical, for Physical Properties
Aero Electronics
Applied Research Labs.
Associated Research
Baldwin-Lima-Hamilton
Berkshire Labs.
Boonton Radio
Branson Insts. Inc.
Bristol Co.
Brush Electronics
Cady & Co.
Consol. Electrodynamics
Control Devices
Custom Scient. Insts.
Davenport Mfg. Co.
Dice Co., J. W.
Dit-Mco, Inc.
Eder Instr. Co.
Electro Devices Inc.
Electro Instr. Inc.
Electro Products Labs.
Ferner Co.
G.E. Apparatus Sales
General Radio
Genisco Inc.
Hathaway Instr. Co.
Isotope Products
Kinetic Instr. Co.
Magnaflux Corp.
Magnatran Inc.
Marion Electcl. Instr.
Nuclear Research
Quad Electric
Peschel Electronics
Ramo-Wooldridge
Robertshaw-Fulton
Sheffield Corp.
Simpson Electric
Sperry Products
Sunshine Scientific
Sweets Co., Martin
Testing Machines, Inc.
Thwing-Albert
Tri-Tronics Co.
Triplett Electcl. Instr.
U. S. Testing Co.
Vibro-Ceramics

TESTERS, Oxygen, see Gas Analyzers

TESTERS, Piston Ring, see Dimensional Gages

TESTERS, Radio Set, see Circuit Analyzers

TESTERS, Radio Tube, see Tube Testers, Electron

TESTING INSTRUMENTS, Optical, see Optical Testing Instruments

TESTING MACHINES (UNIVERSAL) CALIBRATORS, including Proving Rings
Amer. Instr. Co.
Baldwin-Lima-Hamilton
Buehler, Ltd.
Custom Scient. Insts.
Daytronic Corp.
Genisco Inc.
Gilmore Industries
Morehouse Mach. Co.
Olsen Testing Machine
Pittsburgh Inst. & Mach.
Rainhart Co.
Soiltest, Inc.
Steel City Testing Machs.
Testing Machines Inc.
Thwing-Albert

TESTING MACHINES, Bursting, see Bursting Testing Machines

TESTING MACHINES, Fatigue, see Fatigue

TESTING MACHINES, Glass Strain, see Glass Test

TESTING MACHINES, Gummed Tape, Paper, see Paper Test

TESTING MACHINES, High Pressure, see Bursting Testing Machines

TESTING MACHINES, Knit Goods, see Textile Testing

TESTING MACHINES, Leather, see Leather Testing

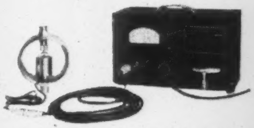
TESTING MACHINES, Miscellaneous, including Alternating Stress, Bending, Compression, Creep, Deflection, Ductility, Impact, Pendulum, Stiffness and Bending, Stretch, etc. (see also Testing Machines, Universal)
Airdraulics Engrg. Co.
Allegany Instr. Co.
Amer. Instr. Co.
American Research
Ames Prec. Machine
Amthor Testing
Analysis Sales
Ann Arbor Instr. Wks
Asch Equipment Co
Bacharach Indust. Instr.
Baldwin-Lima-Hamilton
Black & Decker
Bock Machine Co.
Boulin Instr. Corp.
Branson Instruments
Brush Assocs., G. F.
Brush Electronics
Buehler, Ltd.
Cambridge Instr. Co.
Carver, Fred S.
Central Scientific
Chapman Labs.
Chatillon & Sons
Clark Instrument Inc.
Control Devices
Custom Scient. Insts.
Detroit Testing Mach. Co.
Dietert Co.
Dillon & Co., W. C.
Dommers Co.
Dorr-Patterson Engrg. Co.
Edin Electronics
Edwards, L. V.
Electro Products Labs.
Emery Co., A. H.
Engrg. & Research Corp.
Engineers Specialty Div.
Exact Weight Scale Co.
Ferner Co.
Gadgets Inc.
Gaertner Scientific
Gardner Lab.
GE
Genisco Inc.

CALIBRATION EQUIPMENT TO MEET THE MOST EXACTING REQUIREMENTS IN THE MECHANICAL FORCE MEASURING FIELD

MOREHOUSE PROVING RINGS

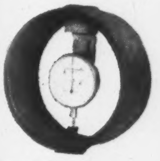
Calibrated and *certified* by the National Bureau of Standards. Meets all Federal and A.S.T.M. specifications for calibrating testing machines. Features sustained high accuracy of 1/10 of 1% over long periods of time, even under adverse conditions of use. Capacities to 300,000 lbs. in Compression type, and 100,000 lbs. in the Tension and Compression type.

CALIBRATING SYSTEM



Has proving ring accuracy and ruggedness together with remote control. Allows the most inexperienced operator to obtain results well within 1/10 of 1%. Calibration and Report by the National Bureau of Standards. Capacities to 300,000 lbs. in Compression type, and 100,000 lbs. in Tension and Compression type.

RING DYNAMOMETER



Used in place of proving rings where sustained high accuracy is not required. Accuracy is 1/10 of 1%. Use of the dynamometer is limited to loads calibrated, and not continuous dial indication. Capacities to 300,000 lbs. in Compression.

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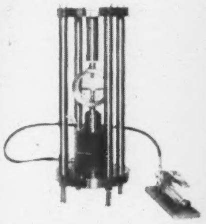
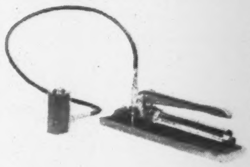


Designed to utilize the dependable accuracy of certified proving rings for the calibration of load cells and other portable force measuring devices in Tension or Compression. Adaptable to all types of conventional load cells. Standard capacities to 100,000 lbs. Special and larger capacities to order.

HYDRAULIC JACK



Applies forces through the calibrating instrument to the load cell for "in position" calibration. Features low friction packing to insure smooth operation, negligible leak rate and an auxiliary screw piston on pump for fine adjustment of ram.

MOREHOUSE MACHINE CO.

233 W. Market Street

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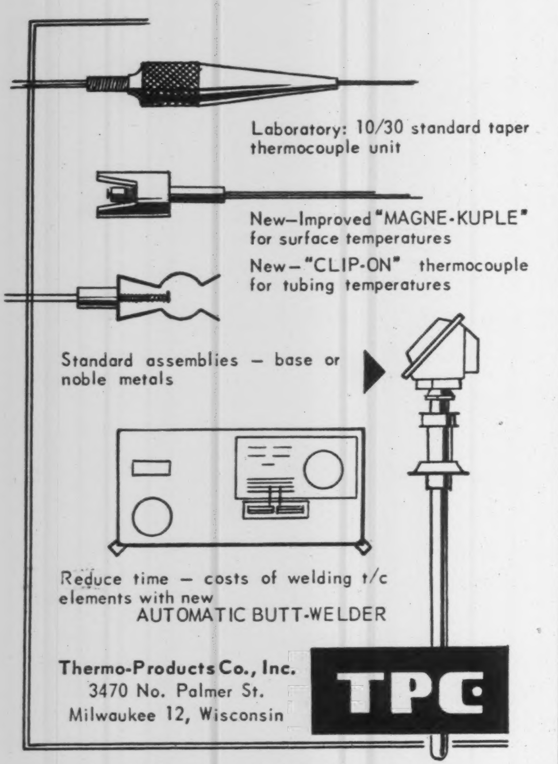
For more information circle 370 on inquiry card.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Standard assemblies — base or noble metals

Reduce time — costs of welding t/c elements with new AUTOMATIC BUTT-WELDER

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Milwaukee 12, Wisconsin

TPC

For more information circle 371 on inquiry card.

Geotechnical Corp.
Gogan Mach. Corp.
Gordon Co., Claud S.
Gorrell & Gorrell
Gurley, W. & L. E.
Hacker & Co., W. J.
Hathaway Instr. Co.
Hayes Scient. App.
Humboldt Mfg. Co.
Hunter Spring
Impact Register Co.
Impactograph Corp.
Industrial Engrg. Co.
Insco Co.
Instron Engrg. Corp.
Jan Hardware Mfg. Co.
Kahn & Co.
Krouse Testing Machine
L. A. B. Corp.
Lessels & Assocs.
Link Engrg. Co.
M. B. Mfg. Co.
Mantec, Inc.
Marshall Co., L. H.
Martin-Hubbard Corp.
Matisa Equipment
Metron Instr. Co.
Multi-Amp Corp.
National Forge
Olsen Testing Machine
Opplem Co., Inc.
Pacific Scientific
Pacific Transducers
Pelouze Mfg. Co.
Perkins & Son
Pittsburgh Instr. & Mach.
Potter Co.
Precision Scientific
R.C.A. Manufacturing
Radio Frequency Labs.
Rainhart Co.
Riehle Testing Machine
Schauer Mfg. Co.
Scientific Instr. Co.
Scott Testers, Inc.
Shasta Div.
Size Control Co.
Soiltest, Inc.
Steel City Testing Machs.
Sturtevant Co.
Sun Electric
Suter, Alfred
Sweets Co., Martin
Tabor Instr. Corp.
Testing Machines, Inc.
Thwing-Albert
Toledo Scale Co.
U. S. Testing Co.
Universal Aviation
Vectron, Inc.
Wabash Metal Prods.
Whittington Pump

TESTING MACHINES, Paper, see Paper Testing

TESTING MACHINES, Pipe and Tube, see Pipe and Tube Testing Machines

TESTING MACHINES, Universal, Dead Weight Beam

Ann Arbor Instr. Wks.
Dietert Co.
Dillon & Co., W. C.
Ferner Co.
Gordon Co., Claud S.
Hacker & Co.
Ideal-Aerosmith
Jan Hardware Mfg. Co.
Olsen Testing Machine
Refinery Supply
Riehle Testing Machines
Scott Testers, Inc.
Taller & Cooper
Testing Machines, Inc.
Thwing-Albert

TESTING MACHINES, Universal, Hydraulic

Ann Arbor Instr. Works
Auto Control Labs.
Baldwin-Lima-Hamilton
Con Ray Corp.
Detroit Testing Mach.
Dietert Co., Harry W.
Eitzen Co., Louis C.
Electro Products Labs.
Emery Co., A. H.
Ferner Co.
Gordon Co., Claud S.
Hacker & Co.
Indust. Engrg. Corp.
Kahn & Co., Inc.
Olsen Testing Mach.
Pacific Scientific
Pittsburgh Instr. & Mach.
Riehle Testing Machines
Soiltest, Inc.
Steel City Testing Mach.
Superdraulic Corp.
Testing Machines, Inc.
Thwing-Albert
United Mfg. Co. Div.
Vectron, Inc.
Wabash Metal Prods.
Wroble Engrg. Co.

TESTING MACHINES, Universal, Spring Dynamometer

Ann Arbor Instr. Wks.
Baldwin-Lima-Hamilton
Buehler, Ltd.
Chatillon & Sons
Dietert Co.
Dillon & Co., W. C.
Dorr-Patterson Engrg.
Ferner Co.
Gordon Co., Claud S.
Hacker & Co.
Hayes Scientific App.
Industrial Electronics
Industrial Engrg. Co.
Link Engrg. Co.
Olsen Testing Mach.
Pacific Scientific
Riehle Testing Machines
Scott Testers, Inc.
Seederer-Kohlbusch
Stoelting Co., C. H.
Testing Machines, Inc.
Thwing-Albert
Toledo Scale Co.
United Mfg. Co. Div.
Webb Co., Jervis B.

TESTING MACHINES, Vibration, see Vibration

TESTING MACHINES, Wire, see Wire Testing Machines

TESTING SETS, see the Object of Measurement and Test

TESTING SETS, Automotive, see Engine Test

TESTING SETS, Electrical, see Circuit Testers

TESTING SETS, Meters, Electrical, see Electrical Instrument Calibrators

TESTING SETS, Water, see Water Analysis

TEXTILE TEST INSTRUMENTS and MACHINES

Amer. Instr. Co.
Amthor Testing
Anderson Machine Shops
Ann Arbor Instr. Co.
Atlas Elect. Devices Co.
Baldwin-Lima-Hamilton
Boulin Instr. Corp.
Brabender Corp.
Brush Electronics
Bush Assocs., G. F.
Cambridge Instr. Co.
Chatillon & Son
Custom Scientific Insts.
Dillon & Co., W. C.
Emerson App. Co.
Federal Products
Fielden Instr. Div.
Geier & Bluhm
GE
Gilmore Industries
Gurley, W. & L. E.
Hacker & Co.
Hart Moisture Gage
Hygrotester, Inc.
Instron Eng. Corp.
Jerpbak-Bayless
Matisa Equipt. Co.
Mico Instr. Co.
Minneapolis-Honeywell
Norcross Corp.
Olsen Testing Mach.
Opplem Co., Inc.
Pacific Scientific
Pelouze Mfg. Co.
Perkins & Son
Riehle Testing Machine
Saxl Instr. Co.
Schaevitz Engineering
Scott Testers, Inc.
Shawmut Engrg. Co.
Sheffield Corp.
Shore Instr. & Mfg. Co.
Sipp-Eastwood
Special Instruments Lab.
Standard Electric
Statham Labs.
Steel City Testing Machs.
Suter, Alfred
Taber Instr. Co.
Tensitron, Inc.
Testing Machines, Inc.
Thwing-Albert
U. S. Testing Co.
Ultra-Violet Prods.
Zeiss, Inc., Carl

THEODOLITES, see Surveying Instruments

THEODOLITES, Magnetic

Askania-Werke A. G.
Berger & Sons
Gulton Mfg. Co.
Gurley, W. & L. E.
Helio Instr. Co.
Internat. Devel. Co.
Opplem Co., Inc.
Ruska Instr. Corp.
Suverkrop Instruments
White Co Inc., David
Wild Heerbrugg

THEODOLITES, Pilot Balloon

Askania-Werke A. G.
Davidson Mfg. Co.
Fecker Inc., J. W.
Gordon Enterprises
Gulton Mfg. Co.
Gurley, W. & L. E.
Helio Instr. Co.
Los Angeles Scient. Instr.
White Co., Inc., David

THERMIONIC RECTIFIERS, see Rectifiers, Thermionic

THERMISTOR MOUNTINGS

Aero Research Instr. Co.
Barnes Engrg. Co.
Narda Corp.
Polytechnic Res. & Dev. Co.
Tell-Tronics Prods.
Victory Engrg. Corp.
WacLine, Inc.
Weinschel Engrg. Co.
Yellow Springs Instr. Co.

THERMISTORS

Baird Assocs.-Atomic Instr.
Barnes Engrg. Co.
Bendix, Friez Instr. Div.
Bond Electronics Corp.
Clarostat Mfg. Co.
Computer Co. of Amer.
Electron-Radar Prods.
Fenwal, Inc.
GE, Metall. Prods. Dept.
Hewlett-Packard
Internat. Std. Trading
Kybernetes Corp.
Narda Corp.
Olympic Devel. Co.
Robertshaw-Fulton
Servo Corp. of Amer.
Sprague Electric
Stupakoff Div.
Victory Engr. Corp.

THERMO-AMMETERS, see Ammeters

THERMOCOUPLE CIRCUIT TESTERS, including Restorers

B & H Instr. Co.
Barber-Colman Co.
Bristol Co.
Jarco Services, Inc.
Lewis Engrg. Co.
Pace Engrg. Co.
Peerless Electric

THERMOCOUPLE INSULATORS

Airflo Instr. Co.
Bristol Co.
Centralab
Ceramaseal Co.
Conax Corp.
Electro-Tech Equipment
Elematic Equipt. Corp.
Engelhard Inc., Chas.
Gordon Co., Claud S.
Jones Optical
Leeds & Northrup
McDanel Refractory
Pyrometer Instrument Co.
Richards Co., Arklay S.
Saxonburg Ceramics
Stupakoff Div.
Thermal Syndicates, Ltd.
Thermo-Electric Co.
Thermo-Prods. Co.
Thwing-Albert
West Instr. Corp.

THERMOCOUPLE WELLS, see Thermowells

THERMOCOUPLE WIRE and COMPONENTS including Extension Lead Wire

Aero Research
Airflo Instr. Co.
American Platinum Wks.
Assembly Products
Baker & Co.
Barber-Colman
Barrows Porcelain Co.
Bishop & Co., J.
Breeze Corp.
Bristol Co.
Campbell Co., J. A.
Conax Corp.
Corning Glass Works
Driver Co., Wilbur B.
Drive-Harris
Du-Co Ceramics
Eitzen Co.
Electro-Tech Equipt. Co.
Elematic Equipt. Corp.
Englehard, Chas.
Fielden Instr. Div.
Fish-Schurman
Foxboro Co.
GE Apparatus Sales
GE Instrument Dept.
Gordon Co., Claud S.
Hoskins Mfg. Co.
Huppert Co., K. H.
Illinois Testing Labs.
Indus. Pyrometer & Supply
J-B-T Instruments
Karn Chem. Equipt. Co.
Leeds & Northrup
Lewis Engrg. Co.
McDanel Refractory
Minneapolis-Honeywell
  Indust. Div.
Moeller Instr. Co.
Morganite, Inc.
Pyrometer Instr. Co.
Pyrometer Service Co.
Revere Corp. of Amer.
Richards, Arklay S.
Thermal Syndicate Ltd.
Thermo Electric Co.
Thermo-Products Co.
Thwing-Albert
Trinity Equipt. Co.
Turner Electric
Uniform Tubes Inc.
U. S. Rubber
Viking Electric
West Instr. Corp.
Wheatstone Corp.
Wheelco Div.
Winslow Co.

THERMOCOUPLES, Base Metal (see also Wire, Thermocouple)

Aero Res. Instr. Co.
Aerotech Specialties
Airflo Instr. Co.
Assembly Products
Bacharach Indust. Instr.
Bailey Meter Co.
Barber Colman
Bishop & Co., J.
Bristol Co.
Burlington Instr. Co.
Campbell Co., J. A.
Conax Corp.
Cybertronic Corp.
DeJur-Amsco
Dyna-Empire
Eitzen Co., Louis Co.
Elematic Equipt. Corp.
Engelhard, Chas.
Fenwal, Inc.
Foxboro Co.
General Controls
GE, Apparatus Sales
GE, Instrument Dept.
Gordon Co., Claud S.
Gordon Machine & Tool
Hastings—Raydist
Huppert Co.
Illinois Testing Labs.
Indust. Pyrometer & Supply
Industrol Corp.
Instrument Lab., Inc.
J-B-T Instruments
Leeds & Northrup
Lewis Engrg. Co.
Loudon Div., Land-Air
Manning, Maxwell & Moore
Marshall Co., L. H.
Meters, Inc.
Minneapolis-Honeywell
  Indust. Div.
Pacific Scientific
Perkin-Elmer
Propulsion Devel. Labs.
Pyrometer Instr. Co.
Pyrometer Service Co.
Revere Corp. of Amer.
Richards Co., Arklay S.
Simpson Electric
Std. Tool & Mach. Co.
Taylor Instr. Cos.
Thermo-Electric Co.
Thermo-Prods. Co.
Thwing Albert
Trinity Equipt. Corp.
Tube Light Engrg. Co.
Uniform Tubes Inc.
United Optical
Viking Electric
West Instr. Corp.
Wheelco Instr. Div.
Winslow Co.

THERMOCOUPLES, Contact Type (see also Thermometers, Surface)

Aero Res. Instr. Co.
Airflow Instr. Co.
Amer. Thermo-Electric
Assembly Products
Bailey Meter Co.
Barber-Colman
Breeze Corporations
Bristol Co.
Cambridge Instr. Co.
Campbell Co., J. A.

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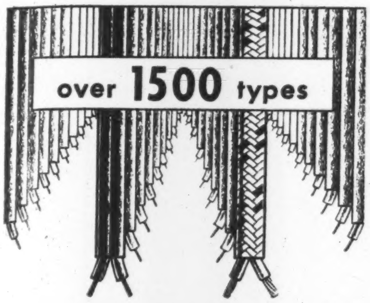

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Thermo Electric makes T/C and T/C extension wires for every conceivable need—actually over 1500 different wire combinations of insulation, calibration and gage size. These include all I.S.A. types, "MIL"-Spec and T-E's versatile "Ceramo" wire.

- **All standard calibrations**
- **Gage sizes from 8 to 40**
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- **Multi-conductor cables**

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Thermo Electric Co. Inc.
Saddle Brook, New Jersey
In Canada—
Thermo Electric (Canada) Ltd., Brampton, Ont.

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86 Standard Types and Ranges

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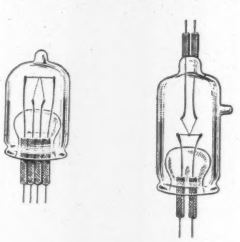

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7269 Santa Monica Blvd.,
Los Angeles 46, Calif.

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Cannon Electric
DeJur-Amsco
Dyna-Empire
Elematic Equipt. Corp.
Engelhard, Charles
Field Electcl. Instr.
Freas Glass Works
General Controls Co.
GE, Apparatus Sales
GE, Instrument Dept.
Gordon Co., Claud S.
Hickok Electcl. Instr.
Illinois Testing Labs.
Instrument Lab., Inc.
J-B-T Instruments
Lewis Engrg. Co.
Minneapolis-Honeywell
  Indust. Div.
Phen-Trols, Inc.
Precision Tube Co.
Propulsion Devel. Labs.
Pyrometer Instr. Co.
Pyrometer Service Co.
Revere Corp. of Amer.
Richards Co., Arklay S.
Rowe Engrg. Co.
Sensitive Res. Instr.
Simpson Electric
Thermo-Couple Prods.
Thermo-Electric Co.
Thermo-Prods. Co.
Thwing-Albert
Trinity Equipt. Corp.
Ultradyne Engrg. Co.
Uniform Tubes, Inc.
Viking Electric
West Instr. Corp.
Wheelco Instr. Div.
Winslow Co.

THERMOCOUPLES, Immersion

Aero Res. Instr. Co.
Autoclave Engrs.
Barber-Colman
Bristol Co.
Elematic Equipt. Corp.
Gordon Co., Claud S.
Harco Labs.
Illinois Testing Labs.
Instrument Lab., Inc.
Leeds & Northrup
Lewis Engrg. Co.
Marshall Co., L. H.
Minneapolis Honeywell
  Industr. Div.
Propulsion Devel. Labs.
Pyrometer Instr. Co.
Revere Corp. of Amer.
Richards Co., Arklay S.
Std. Tool & Mach. Co.
Taylor Instr. Cos.
Thermo-Couple Prods.
Thermo Electric Co.
Thermo-Prods. Co.
Thwing-Albert
Trinity Equipt. Corp.
West Instr. Corp.

THERMOCOUPLES, Rare Metal, including Platinum (see also Wire, Thermocouple)

Aero Res. Instr. Co.
Amer. Platinum Works
Baker & Co., Inc.
Barber-Colman
Bishop & Co., J.
Bristol Co.
Foxboro Co.
Gordon Co., Claud S.
Harco Labs.
Illionis Testing Labs
Leeds & Northrup
Lewis Engrg. Co.
Minneapolis-Honeywell
  Indust. Div.
Richards Co., Arklay S.
Taylor Instr. Cos.
Thermo-Couple Prods.
Thermo Electric Co.
Thermo-Prods. Co.
Thwing-Albert
Trinity Equipt. Corp.
West Instr. Corp.

THERMOCOUPLES, Separate Heater Type

Aero Res. Instr. Co.
Amer. Thermo-Electric
Barber Colman
Beam Instr. Corp.
Breeze Corporations
Bristol Co
Campbell Co., J. A.
Dyna-Empire
Electro-Tech Equipt. Co.
Electron-Radar
Field Electl. Instr. Co.
General Controls Co.
GE
General Radio Co.
Gordon, Claud S.
Harco Labs.
Illinois Testing Labs.
Lewis Engrg. Co.
Sensitive Res. Instr.
Thermo Electric Co.
Thermo-Prods. Co.
Ultradyne Engrg. Co.
Vacuum Tube Prods.
West Instr. Corp.
Wheelco Instr. Div.

THERMOCOUPLES, Vacuum

Amer. Thermo-Electric
Barber-Colman
Beam Instr. Corp.
Beckman Instruments
Biddle Co., James G.
Cambridge Instr. Co.
Consolidated Vacuum Corp.
Distillation Products
Farrand Optical
Fredericks Co., George
Field Electl. Instr. Co.
GE-Apparatus Sales
General Radio Co.
Gordon Co., Claud S.
Harco Labs
Hastings-Raydist
Hickok Electcl. Instr.
High Vacuum Equipt. Corp.
National Research
Perkin-Elmer
Phen-Trols Inc.
Philadelphia Scientific
Pyrometer Instr. Co.
Rawson Electcl. Instr.
Sensitive Res. Instr.
Thermo-Electric Co.
Thermo-Prod. Co.
Trinity Equipt. Corp.
Ultradyne Engrg.
Universal X-Ray Prods.
Vacuum Tube Products Co.
Wheelco Instr. Co.

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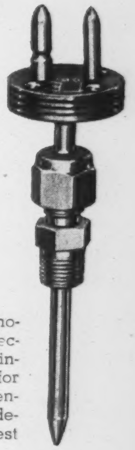

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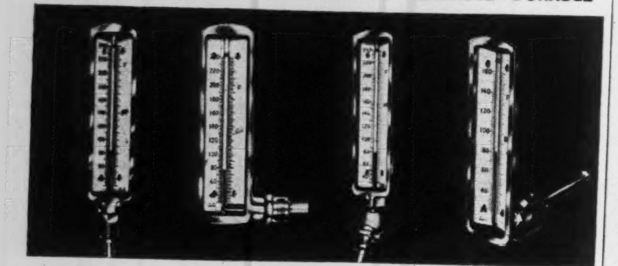

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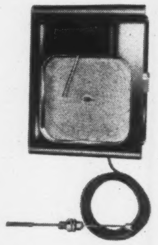

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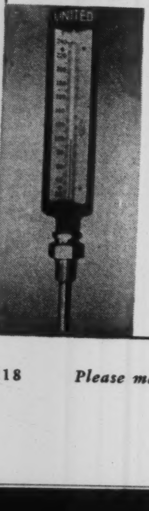

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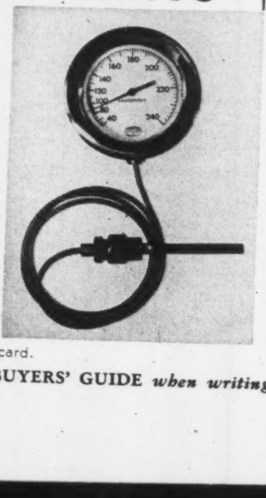

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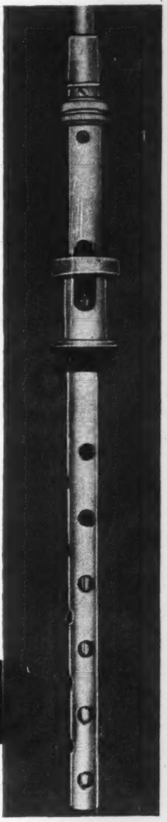

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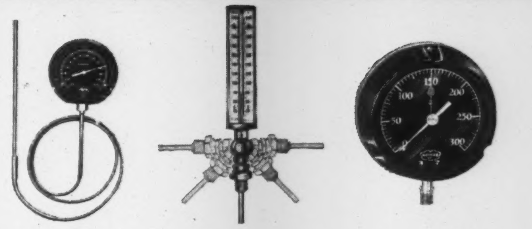

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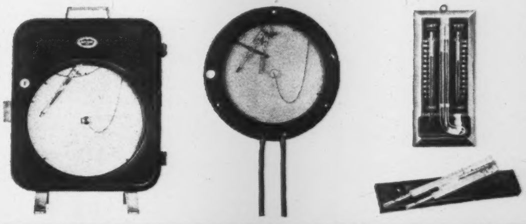

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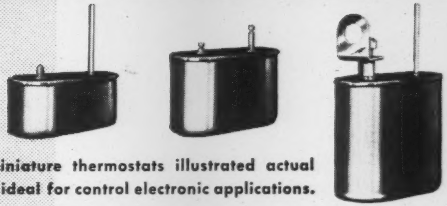

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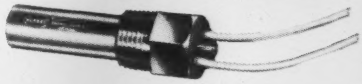

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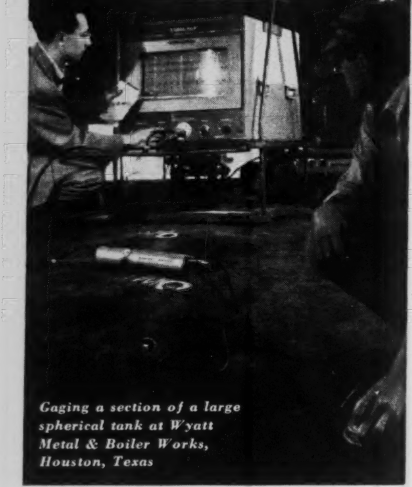

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Thermo-Electric Co.
Thermometer Corp.
Thwing-Albert
Trerice Co., H. O.
Trinity Equipt. Corp.
Turner Electric
United Electric Controls
U. S. Gauge Div.
Universal-Cyclops Steel
Victory Engrg. Co.
Weksler Thermom. Corp.

THICKNESS GAGES, Eddy Current (see also Dimensional Gages)

Boonton Radio Corp.
Unit Process Assemblies

THICKNESS GAGES, Magnetic

Aero Electronics
Amer. Instr. Co.
Branson Instruments
Bristol Co.
Cleveland Instr. Co.
Commercial Res. Div.
Daytronic Corp.
Electric Eye Equipt. Co.
Federal Products
Gardner Lab.
GE, Apparatus Sales
Hathaway Instr. Co.
Hickok Electcl. Instr.
Hygrotester Inc.
Industrial Electronics
Krouse Testing Machine
Magnaflux Corp.
Metron Instr. Co.
Pratt & Whitney Co.
Schaevitz Engrg.
Sheffield Corp.
Sunshine Scientific

THICKNESS GAGES, Radiation

Branson Insts. Inc.
GE, X-Ray Dept.
Industrial Nucleonics
Instruments Inc.
Isotope Products
Nuclear Corp. of Amer.
Pratt & Whitney

THICKNESS GAGES, Ultrasonic

Branson Instruments
Bristol Co.
Dice Co., J. W.
DoAll Co.
Gulton Mfg. Co.
Instruments, Inc.
Kahn & Co.
Magnaflux Corp.
Photocon Research
Sheffield Corp.
Sunshine Scientific
Vibro-Ceramics

THREAD GAGES, see Dimensional Gages

THREAD MEASURING WIRES, see Wires, Thread Measuring

THREADING and TAPPING TOOLS

Allied Products Div.
Automatic Methods
Ex-Cell-O Corp.
Landis Machine Co.
Pratt & Whitney
Sheffield Corp.
Threadmiller Corp.

THYRATRONS, see Tubes, Thyratron

TIDE GAGES, see Hydrologic Instruments

TIME CONTROLLERS, see Timers

TIME INDICATORS, see Clocks, also Watches

TIME INTERVAL APPARATUS, see Counters, also Timers

TIME RECORDERS, including Running Time, Time Operation, Time Totalizers, etc.

Abrams Instr. Corp.
Advanced Electronics
Aero Instr. Co.
Alden Products
Alfax Indust. Instr.
Alina Corp.
American Time Prods.
Amglo Corp.
Amthor Testing Instr. Co.
Authorized Mfrs. Service
Autocall Co.
Automatic Electric
Autom. Electric Sales
Autom. Temp. Control
Bacharach Indust. Instr.
Barbour-Stockwell
Bell & Howell
Bendix, Eclipse-Pioneer
Bendix-Friez
Berkeley Div.
Bristol Co.
Brush Electronics
Burlington Instr. Co.
Calculagraph Co.
Capeway Instr. Corp.
Central Scientific
Century Geophysical
Cincinnati Time Rec. Co.
Clary Corp.
Clebar Watch Co.
Cramer Controls Corp.
Cyclotron Specialties
Dale Instruments
Danco Instruments
Dickson Co.
Doelcam Div.
Ducommun Co.
Electric Tachometer
Electro Devices, Inc.
Electro-Tech Equipt. Co.
Electronic Assocs.
Elematic Sales Corp.
Engler Instr. Co.
Epsco, Inc.
Ess Instr. Co.
Esterline-Angus
Fischer & Porter
Foxboro Co.
Gaertner Scientific
GE, Apparatus Sales
General Controls
Gordon Enterprises
Gorrell & Gorrell
Gotham Instr. Div.
Hamilton Watch
Haydon Co., A. W.
Haydon Mfg. Co.
Hathaway Instr. Co.
Hobbs Corp., S. W.
Hunter Mfg. Co.
Hubb Instrumation
I-L-S Instr. Corp.
Impact Register Co.
Industrial Timer Corp.
Instrument Lab., Inc.
Internat. Business Machs.
Jaeger Watch Co.
J-B-T Instruments
Kybernetes Corp.
Lab. for Electronics
Lafayette Instr. Co.
Larson Instr. Co.
Librascope Inc.
Lumenite Electronics
Marion Electrical Instr.
Marsh Corp., Jas. P.
Martin-Hubbard Corp.
Matisa Equipt. Co.
McDonnell Odometer
Minneapolis-Honeywell
National Time and Signal
Paragon Electric
Parsons Co., Ralph M.
Potter Instr. Co.
Production Instr. Co.
Radiation Instr. Dev. Lab.
Roller-Smith
Sangamo Electric
Scientific Instr. Co.
Serdex, Inc.
Service Recorder Co.
Simplex Time Recorder
Standard Elect. Time
Stewart Instr. Co.
Stoelting Co., C. H.
Streeter-Amet. Co.
Stromberg Electric
Stromberg Time Corp.
Texas Instruments
Thwing-Albert
U. S. Gauge Div.
Vocaline Co. of Amer.
Weksler Thermom. Corp.
Wright Engrg. Co.
Zenith Electric

TIME STANDARDS, see Standards, Time

TIME STUDY APPARATUS

Alden Products
Alfax Paper & Engrg.
Amer. Chronoscope
Autom. Temperature
Bell & Howell
Berndt-Bach, Inc.
Black & Webster
Clare & Co., C. P.
Clebar Watch Co.
Cramer Controls Corp.
Dietzgen Co., Eugene
Dimco-Gray
Ducommun Co., M.
Electric Tachometer Corp.
Engler Instr. Co.
Gordon Enterprises
Gorrell & Gorrell

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Lafayette Instr. Co.
Larson Instr. Co.
National Instr. Co.
Potter Instr. Co.
Seely Instr. Co.
Standard Electric Time
Stewart Instr. Co.
Stoelting Co., C. H.
Technical Instruments
Thompson Clock
Wollensak Optical

TIME SWITCHES, see Switches, Time

TIMERS, Binaural

Walkirt Co.

TIMERS, Miscrosecond (see also Counters, EPUT)

Amer. Chronoscope Corp.
Bristol Engrg. Corp.
Computer Control Co.
Computer Measmts. Corp.
Electro-Pulse, Inc.
General Control Co.
Hubb Instrumation
I-L-S Instr. Corp.
Optronic Co.
Post Machinery Co.
Potter Instr. Co.
Ransom Research
Rutherford Electronics
Std. Electric Time
Std. Electronic Res.
Sucht Co., Herman H.
Walkirt Co.
Wang Labs., Inc.

TIMERS, Process, including Automatic Reset, Cycle, Interval (see also Program Controllers)

A'G'A' Div.
Abrams Instr. Corp.
Advance Electronics
Aemco Inc.
Aero Instr. Co.
Alden Systems
Alfax Paper & Engrg. Co.
Alina Corp.
Allen-Bradley
Amer. Chronoscope
Amer. Time Corp.
Anglo Corp.
Andrew Techn. Supply
Atomlab, Inc.
Auth Electcl. Spec. Co.
Autocall Co.
Autom. Control Co.
Autom. Controls Corp.
Automatic Electric
Automatic Elect. Mfg.
Autom. Temp. Contr. Co.
Bar-Ray Products
Barber-Colman
Barbour Stockwell
Becker Co.
Bellows Co.
Bendix, Eclipse-Pioneer
Berkeley Div.
Betts & Betts
Bristol Co.
Bristol Motor Div.
Browning Labs.
Brush Electronics
Builders-Providence
Burke & James
Cal-Tronics Corp.
Chicago Surgical & Elect.
Cincinnati Time Rec.
Clark Controller Co.
Clary Multiplier
Climax Div.
Coleman Electric
Control Engrg. Co.
Cook Electric
Cooper Co., Clark
Counter & Control Corp.
Crystal Res. Labs.
Cutler-Hammer
Davenport Mfg. Co.
Daystrom Instr. Div.
Daystrom-Pacific
DeJur-Amsco
Denver Fire Clay
Devtronics, Inc.
Dietz Co., Henry G.
Dietz Design & Mfg.
Dimco-Gray
Dirigo Compass & Instr.
Doelcam Div.
Eagle Signal Corp.
Eberbach & Son
Edison Instr. Div.
Electric Tachometer
Electro-Pulse, Inc.
Electronic Control
Electronic Controls, Inc.
Electronic Prods. Co.
Electronic Spec. Co.
Electronics Corp. of Amer.
Electro Prods. Labs.
Electrosig Corp.
Electro Tech Equipt.
Electyme Motor Prods.
Elgin Natl. Watch
Fl Mec Labs.
Emmett Mach. & Mfg.
Engrg. Res. & Devel.
Engler Instr. Co.
Farmer Elect. Prods.
Ferrara Inc.
Fisher Governor
Fisher-Pierce
Foxboro Co.
Fredericks Co., Geo.
Fuel Watchman
G-V Controls
Gaertner Scientific
Gates Electronics Co.
General Controls Co.
GE, Apparatus Sales
GE, Instr Dept.
GE, X-Ray Dept.
Genisco Inc.
Germanow-Simon
Glass Engrg. Labs.
Glogau & Co.
Cordon Enterprises
Gorrell & Gorrell
Gotham Instr. Div.
Gray Instr. Co.
Guardian Elect. Mfg. Co.
Hagan Corp.
Hagen Mfg. Co.
Haledy Electronics Co.
Hamilton Watch
Hansen Co.
Harvey Radio Labs.
Haydon Co., A. W.
Haydon Mfg. Co.
Heiland Div.
Hewlett-Packard
Hobbs Corp., J. W.
Humphreys, Inc.
Hunter Mfg. Co.
Hycon Mfg. Co.
Industrial Timer Corp.
Industrol Corp.
I-L-S Instr. Corp.
Internat. Business Machs.
Internat. Instr. Co.
Internat. Register
Internat. Research
J-B-T Instruments
Jack Scient. Instr.
Jaeger Watch Co.
Jarco Services, Inc.
Jardur Import
Johnson Service
Koehler Instr. Co.
Kopp Scientific
Lab. for Electronics
Labline, Inc.
Leeds & Northrup
Liebel-Flarsheim
Lumenite Electronic
Lux Clock
Magnetic Gauge Co.
Mallory & Co., P. R.
Marion Electrical Instr.
Masco Products
Mason-Nielan Div.
Miller-Harris
Miller, M. C.
Minneapolis-Honeywell
  Indust. Div.
Montgomery Mfg. Co.
Mt. Sopris Instr. Corp.
National Instrument Co.
National Time & Signal
New Haven Clock
Newmatic Corp.
Norden-Ketay
NRD Instruments
Paragon Electric
Partlow Corp.
Penn Electric Switch
Perfex Div.
Peschel Electronics

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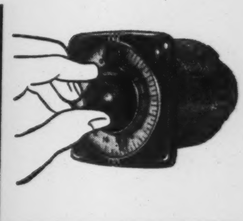
. . . installation
. . . maintenance



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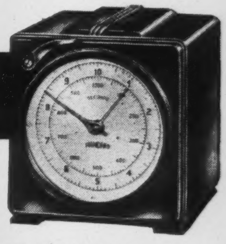
For more information circle **385** on inquiry card.

Standard
TIMERS



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S-60	1/5 sec.	60 min.	±.1 sec.
SM-60	1/100 min.	60 min.	±.002 min.
S-10	1/10 sec.	1000 sec.	±.02 sec.
S-6	1/1000 min.	10 min.	±.0002 min.
S-1	1/100 sec.	60 sec.	±.01 sec.
MST	1/1000 sec.	.360 sec.	±.001 sec.
MST-500	1/1000 sec.	30 sec.	±.002 sec.

WRITE FOR BULLETIN 198
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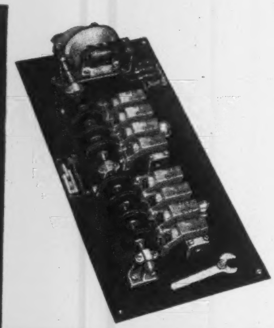
For more information circle **336** on inquiry card.



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Complete data in Bulletin N-101.

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For more information circle **387** on inquiry card.

Photovolt Corp.
Pneu-Trol Devices
Post Machinery
Potter & Brumfield
Potter Instr. Co.
Powers Reg. Co.
Pratt & Whitney
Precision Scientific
Production Instr. Co.
RCA Tube
Ransom Research
Rawson Electric Co.
Res. Appliance Co.
Revere Corp.
Rhodes Inc., M. H.
Richardson-Allen
Roller Smith
Rowe Engineering
Rutherford Electronics
Sangamo Electric
Scientific Instr. Co.
Seely Instr. Co.
Serdex, Inc.
Shepard Labs.
Simpson Electric
Sessions Clock
Sinclair-Collins
Soreng Products
Sparton Cont. Systems
Square D Co.
Std. Elect. Time
Streeter-Amet
Stoelting Co., C. H.
Stromberg Time Corp.
Struthers-Dunn
Sunshine Scientific
Taylor Instr. Cos.
Telechron Inc.
Tensitron, Inc.
Thomas Clock
Thompson Clock
Thordarson-Meissner
Timetrol Co.
Tork Clock
Tri-Tronics Co.
Ulanet Co.
Vacuum Tube Prods.
Vocaline Co. of Amer.
Walkirt Co.
Wallace & Tiernan
Walser Autom. Timer Corp.
Westport Electric
Wheelco Instr. Div.
Wilson & Co., G. C.
Yellow Springs Instr. Co.
Zenith Electric

TIMERS, Spot Weld, see Welding Equipment Control Systems

TIN RIBBON, Block

Alpha Metals
Belmont Smg. Refg.
Division Lead Co.
Federated Metals Div.
Hi-Grade Alloy Corp.
Ney Co.

TITRATION APPARATUS, Electrometric

Ace Glass Inc.
Beckman Div.
Burrell Corp.
Cambridge Instr. Co.
Central Scientific
Coleman Electric
Deltron, Inc.
Electro-Physics Co.
Fisher Scientific
Gray Instr. Co.
Hallikainen Insts.
Internat. Instr. Co.
Kacour Co.
Leeds & Northrup
Macbeth Corp.
Metalab Equipt. Div.
Micro-Metric Instr. Co.
Owens-Illinois Glass
Pfaltz & Bauer
Precision Scientific
QOS Corp.
Roy Co., Milton
Rubicon Co.
Sargent & Co.
Shasta Div.
Technical Equipt. Co.
Thwing-Albert

TITRATION APPARATUS, Manual (see also Laboratory)

Fisher Scientific
Internat. Instr. Co.
Kontes Glass
Metalab Equipt Div.
Thomas Co., Arthur H.
Wakefield Industries
Wallace & Tiernan

TITROMETERS

Fisher Scientific
Hallikainen Insts.
Precision Scientific
RKL Valve & Mfg.

TONG AMMETERS, see Ammeters, Clamp Type

TOOLMAKER'S FLATS

Cal-Astro Optical
DoAll Co.
Lab. Optical Co.
Palos Optical
Pan-technics, Ltd.
Perkin-Elmer
Pratt & Whitney
Testa Mfg. Co.
Van Keuren Co.

TOOLS, Precision

A & M Tool & Die Co.
Acromark Co.
Alden Products
Alina Corp.
Amer. Laubscher Corp.
Baker Products
Barbour Stockwell
Bayside Watch Tool
Bergander Mfg. Co.
Borell & Co., Jules
Brown & Sharpe
ConRay Corp.
Crafts Co., Arthur A.
Daco Machine & Tool
Dearborn Gage
Dixon, Inc., William
DoAll Co.
Edmund Scientific
Elgin Natl. Watch
Engrg. Res. & Devel.
Engis Equipt. Co.
Ercona Corp.
Fonda Gage Co.
G. M. Mfg. Co.
Gaunt Industries
GE, Instrument Dept.
Gustafson Mfg. Co.
Jadow Inc., B.
Jensen Tool Co., H. C.
Jerpbak-Bayless
Jessup Engrg. & Devel.
Johnson Scient. Instr.
Kendrick & Davis Co.
Levin & Son, Louis
Lufkin Rule Co.
Marsh Corp., Jas. P.
Marshall Co.
Mico Instr. Co.
Millers Falls Co.
Mitchell Scientific
Newall Mfg. Co.
New Brunswick Scient. Co.
Ostby & Barton
Pratt & Whitney
Robertson & Ruth
Scherr Co., Inc.
Sound Apparatus Co.
Stafford Co.
Standard Products
Starrett Co.
Sturdy Tool & Gage
Swedish Gage Co.
Sylvania Electcl. Prods.
Vaco Products
Van Keuren Co.
Willey's Carbide Tool Co.
Woodruff & Stokes

TOPOGRAPHIC INSTRUMENTS, see Surveying Instruments

TORQUE CONTROL EQUIPMENT

Aero Electronics
Ahrendt Instr. Co.
Alloy Bellows Engrg.
Askania Reg. Co.
Autom. Temp. Control
Avion Div.
Baldwin-Lima-Hamilton
Cal-Tronics Corp.
Chatillon & Sons
Clark Mfg. Co.
Crescent Engrg. & Res. Co.
Collins Radio
Cutler-Hammer
Daytronic Corp.
Electomic Mechanisms
Electro-Mech. Div.
Electronic Control Corp.
Fielden Instr. Div.
GE, Apparatus Sales
Gilmore Industries
Hagan Corp.
Heller Co., G. K.
Industrial Electronics
Industrial Engrg. Corp.
Jo-Line Tools
Kearfott Co.
Lear Inc.
Livermont, Inc.
Magnetic Amplifiers Inc.
Magnetic Instr. Co.
Mercoid Corp.
Pacific Scientific
Rea Co.
Revco Inc.
Robinette Co., W. C.
Servospeed Div.
Servo-Tek Products
Sturtevant Co., P. A.
Taylor Instr. Cos.
Vectrol Engrg., Inc.
Vectron, Inc.
Vickers Elect. Div.
WacLine, Inc.

TORQUE GAGES

Aero Electronics
Airdraulics Engrg., Inc.
Autom. Temp. Control Co.
Chatillon & Sons
Crescent Engrg. & Res. Co.
Donner Scientific
Federal Products
Fielden Instr. Co.
GE
Gilmore Industries
Gyroscopics, Inc.
Hagan Corp.
Hathaway Instr. Co.
Herman, Victor George
Industrial Electronics
Internat. Devel. Co.
Jensen Tool Co., H. C.
Jo-Line Tools
Link Engrg. Co.
Metron Instr. Co.
Pelouze Mfg. Co.
Revco, Inc.
Riehle Div.
Ruge Assocs., Arthur C.
Shaevitz Engineering
Statham Labs.
Sturdy Tool & Gage
Sturtevant Co.
Taylor Instr. Cos.
Toledo Scale
U. S. Gauge Div.
Waters, Mfg., Inc.

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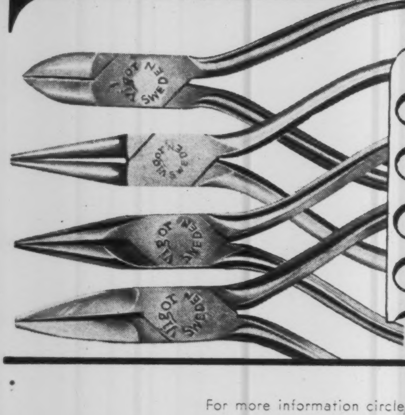
Aero Electronics
Airdraulics Engrg. Co.
Allegany Instr. Co.
Ann Arbor Instr. Works
Asch Equipt. Co.
Avion Div.
Baldwin-Lima-Hamilton
Bendix Aviation Corp.
Boulin Instr. Corp.
Bristol Co.
Brush Electronics
Buehler, Ltd.
Cameron Iron Works
Chatillon & Sons
Clark Mfg. Co.
Colman Instr. & Mfg.
Colvin Labs.
Conoflow Corp.
Control Engrg. Co.
Cosa Corp
Crescent Engrg. & Res. Co.
Dillon & Co., W. C.
Doelcam Div.
Dynamatic Corp.
Emery Co., A. H.
Ercona Corp.



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GE, Apparatus Sales
Gilmore Industries
Gyroscopics, Inc.
Hagan Corp.
Hamilton Watch
Hathaway Instr. Co.
Hayes Scient. Apps.
Humphrey Inc.
Industrial Electronics
Indust. Engrg. Corp.
Jo-Line Tools
Kahn & Co.
Karl-Douglas Assoc.
Kellog Switchboard
L. A. B. Corp.
Link Engrg. Co.
Livermont, Inc.
Martin-Hubbard Corp.
Mid-West Dynamometer
Monsell, J. R.
Nankervis Co., G. L.
Olsen Testing Machine
Orban Co., Kurt
Pitometer Log Corp.
Polyphase Instr. Co.
Radiation Inc.
Revco Inc.
Reliance Elect. & Engrg.
Richmont, Inc.
Riehle Div.
Rubicon Co.
Ruge-de Forest, Inc.
Saxl Instr. Co.
Schaevitz Engineering
Scherr Co., Inc.
Seederer-Kohlbusch
Skyway Prec. Tool
Statham Labs.
Stoelting Co., C. H.
Sturtevant Co.
Sunshine Scientific
Superdraulic Corp.
Swedish Gage Co.
Taller & Cooper
Taylor Dynamometer
Testing Machines, Inc.
Thwing-Albert
Trimount Instr. Co.
Vectron Inc.
Waters Mfg. Co.
Western Gear
Westinghouse Electric
Wiancko Engrg. Co.

TORQUE WRENCHES, see Wrenches, Torque

TORSIOGRAPHS, see Torsion Meters

TORSION METERS

Aero Electronics
Airdraulics Engineering
Baldwin-Lima-Hamilton
Boulin Instr. Corp.
Chatillon & Sons
Commercial Research
Epic Inc.
Hamilton Watch
Hathaway Instr. Co.
Riehle Testing Machines
Saxl Instrument
Sturtevant Co.
Toledo Scale Co.

TOTALIZERS, Demand

Amer. Meter Co.
Berkeley Div.
Esterline-Angus
GE, Apparatus Sales
Landis & Gyr
Leeds & Northrup
Metrotype Corp.
Sangamo Electric
Westinghouse Electric

TOTALIZERS, Electric Energy

Autocall Co.
Autom. Electric
Bristol Co.
Engrg. & Research Corp.
Esterline-Angus
GE, Apparatus Sales
Landis & Gyr
Leeds & Northrup
Metrotype Corp.
Radiation Instr. Dev. Lab.
Sangamo Electric
Stewart Instr. Co.
Streeter-Amet.
Westinghouse Electric

TOTALIZERS, Fluid Flow and/or Gas Flow, see Flow Totalizers

TOTALIZERS, Running Time, see Time Recorders

TRAFFIC SIGNALING DEVICES

A'G'A' Div.
Airborne Instruments
Amglo Corp.
Autom. Electric
Autom. Temp. Control Co.
Bullard Co.
Eagle Signal Corp.
Eastern Industries, Inc.
Emarco Corp.
Flett Lab.
GE, Apparatus Sales
Kemlite Labs.
Natl. Time & Signal
Photoswitch, Inc.
Rea Co., J. B.
Reynolds Electric
Sangamo Electric

TRAMMELS, Steel Beam

Brown & Sharpe
Lufkin Rule Co.
Starrett Co.

TRANSDUCERS. Note: A transducer converts one form of POWER into another. For numerous primary measuring devices see the correct headings under the measurables, e.g. Displacement Pickups, Flow Pickups, Pressure Pickups, etc.

TRANSDUCERS, Ultrasonic

AiResearch Mfg. Co.
Andersen Labs.
Atlantic Research
Atlas Engrg. Co.
Bendix-Pacific
Bendix, Pioneer-Central
Beta Corp.
Branson Instruments
Chesapeake Instr. Corp.
Corbett Science Labs.
Electronics Co.
Electro-Mec Lab.
Electro Prods. Labs.
Dyna-Empire
Fischer & Porter Co.
GE, Appartus Sales
Gen. Precision Lab.
General Ultrasonics Co.
Gulton Mfg. Co.
Hewlett-Packard
Knights Co., James
Laboratory for Electronics
Massa Labs.
Monsell, J. R.
McKenna Labs.
Moore Corp., John B.
Natl. Aircraft Corp.
Premier Res. Labs.
Raytheon Mfg. Co.
Reed Res. Inc.
Rutico, Inc.
Sangamo Electric
Sperry Products
Valpey Crystal Corp.
Vibro-Ceramics

TRANSFORMERS, Adjustable, see Transformers, Variable

TRANSFORMERS, Constant Voltage (see also Voltage Regulators)

Acme Electric
Aircraft Transformer
Airdesign Inc.
Airpax Products
Allied Radio Corp.
Allis-Chalmers
Amplifier Co.
Amplifier Corp. of Amer.
Atlas Engrg. Co.
Basler Electric
Better Coils & Transf.
Boonton Radio
California Magnetic
Carad Corp.
Chicago Electronic
Chicago Std. Transf. Corp.
Colin Campbell Co.
Cutler Hammer
Dano Electric
Dormeyer Industries
Davis & Co., Inc., Dean
Electronic Transf. Co.
Electrosig Corp.
Federal Telephone
GE, Apparatus Sales
General Controls
General Radio
Goslin Electcl. & Mfg. Co.
Gramer-Halldorson Transf.
Hevi Duty Electric Co.
Jeffries Transf. Co.
Keystone Products
Magnatran Inc.
Magnetic Amplifiers Inc.
Magnetic Instr. Co.
Magnetic Res. Corp.
Martin & Co.
Microtran Div.
Miller Instruments
Natl. Aircraft Corp.
New London Instr. Co.
Pacific Transducer Corp.
Peerless Div., Altec
Perkin Engrg. Co.
Raytheon Mfg. Co.
Reed & Reese
Sola Electric
Sorensen & Co.
Square D Co.
Standard Elect. Prods.
Standard Transf. Corp.
Superior Electric
Sylania Elect. Prods.
Tartak Electronics
Thermador Electcl.
Thordarson-Meissner
Timely Insts. & Conts.
Tracerlab Inc.
Transformer Engineers
Transformers, Inc.
Trenton Transf. Corp.
United States Electronics
United Transf. Corp.
Varo Mfg. Co.
Westinghouse Electric

TRANSFORMERS, Differential, see Displacement Pickups, Differential Transformer

TRANSFORMERS, High Frequency

Acme Electric
Acro Products
Aircraft Transf. Corp.

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Drilling Machines, Sensitive
Eye Loupes (Magnifying Glasses)
Felt Wheels, Cones, etc.
Files, Precision, (Swiss)
Flexible Shaft Outfits & Accessories
Flux, Hard & Soft Soldering
Gauges & Calipers
Hammers & Handles
Knives
Mallets
Mandrels
Micrometers
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Pliers & Cutting Nippers
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Press, Midget Arbor
Reamers, 5 cornered
Saw Blades and Saw Frames
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Solders
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Tools, Opticians
Tweezers
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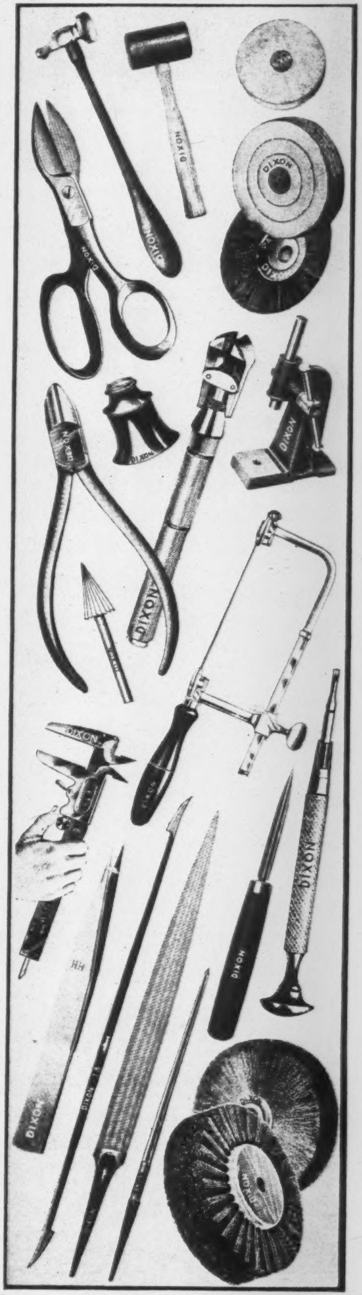

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Cambridge Thermionic
CGS Labs.
Chicago Electronic Engrg.
Colin Campbell Co.
Electronic Transformer Co.
Freed Transf. Co.
Ferranti Electric
GE, Apparatus Sales
Goslin Elect. & Mfg. Co.
Lear, Inc.
Levinthal Electronic Prods.
Magnatran Inc.
Mico Instr. Co.
Microphase Corp.
Microtran Div.
Miller Instruments
Moran Electronic Comp.
Natl. Aircraft Corp.
Osborne Electric
Polyphase Instr. Co.
Raytheon Mfg. Co.
Reed & Reese
Sangamo Electric
Spellman Television
Spencer-Kennedy Labs.
Sterling Transf. Corp.
Texas Instruments
Thermador Electcl. Mfg. Co.
Transformer Engrs.
Triad Transf. Corp.
United States Electronics
United Transf. Corp.
Wirt Company

TRANSFORMERS, Impedance

Acme Electric
Acro Products
Aircraft Transf. Corp.
Airpax Products
Atlas Engrg. Co.
Audio Devel. Co.
Ballastran Corp.
Basler Electric
Better Coil & Transf.
Caledonic Electron & Transf.
Calif. Magnetic Cont. Corp.
Carad Corp.
CGS Labs.
Chapman Labs.
Chicago Std. Transf. Corp.
Colin Campbell Co.
Communication Access. Co.
Dietz Design & Mfg.
Dittmore & Freimuth
Dyna-Empire
Electronic Transf. Co.
Femco, Inc.
Ferranti Electric
Freed Transf. Co.
GE, Apparatus Sales
General Controls
General Radio
Goslin Elect. & Mfg. Co.
Gramer-Haldorsen
Hansen Electronics
Hevi Duty Electric
Hycon Electronics
Hycor Div.
Keystone Products
Langevin Mfg. Co.
Linear Equipt. Labs.
Magnetic Instr. Co.
Mechaponents Div.
Merit Transf. Corp.
Mico Instr. Co.
Microtran Div.
Miller Instruments
Natl. Aircraft Corp.
New London Instr. Co.
N. Y. Transf. Co.
NYT Electronics, Inc.
Osborne Electric
PCA Electronics
Polyphase Instr. Co.
Raytheon Mfg. Co.
Sangamo Electric
Sorensen & Co.
Southw. Ind. Electronics
Sperry Gyroscope
Standard Transf. Corp.
Sterling Transf. Corp.
Sylvania Elect. Prods.
Telex, Inc.
Tarkak Electronics
Thermador-Electcl. Mfg.
Thordarson-Meissner
Transformer Engrs.
Transformers, Inc.
Trenton Transf. Corp.
Triad Transf. Corp.
United States Electronics
United Transf. Corp.
Varo Mfg. Co.

TRANSFORMERS, Input Output, and Interstage, including AF, IF, and RF

Aeronox Corp.
Acme Electric
Acro Products Co.
Airpax Products
Altec Lansing Corp.
Amplifier Corp. of Amer.
Atlantic Transf. Div.
Atlas Engrg. Co.
Audio Devel. Co.
Avion Div.
Caledonia Electronics
Calif Magnetic Cont. Corp.
Cambridge Thermionic
Carad Corp.
Carol Electronics
Chicago Std. Transf. Corp.
Colin Campbell Co.
Communication Access. Co.
Dietz Design & Mfg.
Dittmore-Freimuth Corp.
Dormeyer Industries
Dormitzer Elect. & Mfg.
Electronic Transf. Co.
Freed Transformer
GE, Apparatus Sales
General Instr. Co.
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General Transf. Co.
Gordos Corp.
Goslin Elect. & Mfg. Co.
Gramer Transf. Corp.
Gudeman Co.
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Natl. Aircraft Corp.
Peerless Div., Altec
Raytheon Mfg. Co.
Reed & Reese
Sangamo Electric
Sickles Div.
Southw. Ind. Electronics
Standard Elect. Prods.
Sterling Transf. Corp.
Tartak Electronics
Telex, Inc.
Texas Instruments
Thermador Electcl. Mfg.
Texas Instruments
Torwico Electronics
Transformer Engrs.
Transformers, Inc.
Triad Transf. Corp.
United States Electronics
United Transf. Corp.
Weston Electcl. Instr.
Wirt Company
Wheeler Insul. Wire, Inc.

TRANSFORMERS, Instrument, including Current, and/or Potential, Laboratory

Acme Electric
Acro Products
Aeromarine Instr. Co.
Aircraft Transf. Corp.
Airdesign, Inc.
Airpax Products
Allied Control Co.
Allis-Chalmers
Altec Lansing Corp.
Amplifier Co.
Annis Co., R. B.
Asch Equipt. Co.
Assembly Products
Associated Research
Atlantic Transf. Div.
Atlas Engrg. Co.
Audio Devel. Co.
Avion Div.
Ballastran Corp.
Basler Electric
Bendix, Eclipse-Pioneer
Bendix-Friez
Better Coil & Transf.
Bristol Co.
Burlington Instr. Co.
Burrell Corp.
Calif. Magnetic Cont. Corp.
Carad Corp.
Central Scientific
Chapman Labs.
Chicago Electronic Engrg.
Chicago Transformer
Clough Brengle Co.
Columbia Elect. Mfg.
Communication Access. Co.
Computer Engrg.
Control Corp.
Daven Co.
Daystrom Instrument
Dietz Design & Mfg.
Dinion Coil Co.
Dittmore & Freimuth
Dormeyer Industries
Eastern Specialty Co.
Electro-Tech Equip. Co.
Electro Voice, Inc.
Electronic Transformer Co.
Electronics, Inc.
Electrosig Corp.
Essex Wire Corp.
Esterline-Angus
Federal Telephone & Radio
Ferranti Electric
Freed Transformer
GE, Apparatus Sales
GE, Instrument Dept.
General Controls
General Radio
General Winding
Gorrell & Gorrell
Goslin Electric & Mfg.
Gramer-Halldorson
Hagan Corp.
Hevi-Duty Electric
Hickok Electcl. Instr.
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Instrument Labs
Kenyon Transformer
Keystone Products
Knopp Inc.
Laboratory Equipt. Corp.
Langevin Mfg. Corp.
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Mico Instr. Co.
Microtime Labs.
Microtran Div.
Miller Instruments
Miller Transformer
Millivac Instruments
Mt. Sopris Instr. Corp.
Natl. Aircraft Corp.
NJE Corp.
New London Instr. Co.
New York Transf. Co.
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Nuclear Measmts. Corp.
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Sierra Electronic Corp.
Simpson Electric
Sola Electric
Sorensen & Co.
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Std. Elect. Prods.
Std. Science Supply
Std. Transf. Corp.
Sterling Transf. Corp.
Stitcht Co.
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Sylvania Elect. Prods.
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Texas Insts., Inc.
Thermador Electcl. Mfg. Co.
Thordarson-Meissner
Torwico Electronics
Transformer Engrs.
Transformers, Inc.
Trenton Transf. Corp.
United Optical
United States Electronics
United Transf. Corp.
Universal Scientific
Varo Mfg. Co.
Westinghouse Electric
Weston Electcl. Instr.

TRANSFORMERS, Insulation Testing

Acme Electric
Aircraft Transf. Corp.
Airdesign, Inc.
Airpax Products
Associated Research
Ballastran Corp.
Basler Electric
Beta Electric Corp.
Better Coils & Transfs.
Campbell Electric
Chapman Labs.
Chicago Electronic
Del Electronics
Electronic Transf. Co.
Ferranti Electric
Freed Transf. Co.
General Controls
GE, Apparatus Sales
Goslin Electric & Mfg. Co.
Gramer-Halldorson
Hevi-Duty Electric
Knopp Inc.
Langevin Mfg. Corp.
Lenkurt Electric
Magnatran Inc.
Magnetic Instr. Co.
Miller Instruments
NJE Corp.
NYT Electronics
New Jersey Electronics
Opad Electric
Peschel Electronics
Precise Measmts. Co.
Sherron Metallic
Spellman TV Corp.
Standard Transf. Corp.
States Co.
Sterling Transf. Corp.
Superior Electric
Thermador Electcl. Mfg.
Thordarson-Meissner
Transformer Engineers
Trenton Transf. Corp.
Triad Transf. Corp.
United Transf. Corp.

TRANSFORMERS, Isolation

A'G'A Div.
Acme Electric
Acro Products
Airpax Products
Altec-Lansing
Assembly Products
Atlantic Transf. Div.
Audio Devel. Co.
Beta Electric
Calif. Magnetic Cont. Corp.
Chicago Electronic Engrg.
Chicago Std. Transf. Corp.
Coast Coil Co.
Colin Campbell Co.
Del Electronics
Dietz Design & Mfg.
Dormeyer Industries
Electronic Transf. Co.
Ferranti Electric
GE, Apparatus Sales
General Transformer
Goslin Electric & Mfg. Co.
Gramer-Halldorson
Hevi Duty Elec. Co.
Kenyon Transf. Co.
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Magnavox Co.
Mechaponents Div.
Microtran Div.
Miller Instruments
NJE Corp.
NYT Electronics, Inc.
Natl. Aircraft Corp.
Opad Electric
Osborne Electric
Peerless Div., Altec
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Viking Electric
Wheeler Insul. Wire, Inc.

TRANSFORMERS, Microwave

Acme Electric
Aircraft Transf. Corp.
Audio Devel. Co.
Basler Electric
Better Coil & Transfs.
Carad Corp.
Chicago Std. Transf. Corp.
Electronic Transf. Co.
F. R. Machine Works
Freed Transf. Co.
G.E., Apparatus Sales
Goslin Electric & Mfg. Co.
Gramer-Halldorson
Hewlett-Packard
Hycon Mfg. Co.
Kearfott Co.
Keystone Products
Lectronic Res. Labs.
Magnatran Inc.
Maxson Corp., W. L.
Microphase Corp.
Miller Instruments
Natl. Aircraft Corp.
Polytechnic Res. & Devel.
Raytheon Mfg. Co.
Sperry Gyroscope
Sorensen & Co.
Sterling Transf. Corp.
Thordarson-Meissner
United Transf. Corp.
Vectron, Inc.
Viking Electric

TRANSFORMERS, Phasing

Acme Electric
Aircraft Transf. Corp.
Airdesign, Inc.
Ballastran Corp.
Basler Electric
Better Coil & Transfs.
California Magnetic
Chapman Labs.
Chicago Ltd. Transf. Corp.
Colin Campbell Co.
Eastern Spec. Co.
Electronic Transf. Co.
Esterline-Angus
Freed Transformer Co.
GE, Apparatus Sales
Goslin Electric & Mfg. Co.
Gramer-Halldorson
Hycon Electronics
Keystone Products
Langevin Mfg. Corp.
Magnatran Inc.
Magnetic Instr. Co.
Merit Transf. Corp.
Mico Instr. Co.
Miller Instruments
NYT Electronics, Inc.
Natl. Aircraft Corp.
New York Transf. Co.
Opad Electric
Osborne Electric
PCA Electronics
Raytheon Mfg. Co.
Reed & Reese
Sangamo Electric
Southw. Ind. Electronics
States Co.
Sterling Transf. Corp.
Thermador Electcl. Mfg.
Thordarson-Meissner
Torwico Electronics
Transformer Engs.
Transformers, Inc.
Trenton Transf. Corp.
United Transf. Corp.
Varo Mfg. Co.
Viking Electric
Westinghouse Electric

TRANSFORMERS, Power

Acme Electric
Acro Products
Aircraft-Marine Prods.
Aircraft Transf. Corp.
Airdesign, Inc.
Airpax Products
Allied Control Co.
Allis-Chalmers
Altec-Lansing
Amplifier Corp. of Amer.
Atlantic Transf. Div.
Atlas Engrg. Co.
Audio Devel. Co.
Ballastran Corp.
Basler Electric
Bendix, Eclipse-Pioneer
Better Coil & Transfs.
Caledonia Electronics
Calif. Magnetic Cont. Corp.
Chapman Labs.
Chicago Electronic Engrg.
Chicago Std. Transf. Corp.
Colin Campbell Co.
Comar Electric
Communication Access. Co.
Del Electronics
Dietz Design & Mfg.
Dittmore & Freimuth
Dormitzer Elect. & Mfg. Co.
Electronic Transf. Co.
Federal Telephone & Radio
Femco, Inc.
Ferranti Electric
Freed Transf. Co.
General Controls
GE, Apparatus Sales
Goslin Elect. & Mfg. Co.
Gramer-Halldorson
Harvey Radio Labs.
Hevi-Duty Electric Co.
James Vibrapowr Co.
Kenyon Transf. Co.
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Lenkurt Electric
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Magnetic Amplifiers Inc.
Magnetic Instr. Co.
Mechaponents Div.
Merit Transf. Corp.
Microtran Div.
Miller Instruments
Mt. Sopris Instr. Corp.
NJE Corp.
NYT Electronics, Inc.
Natl. Aircraft Corp.
New London Instr. Co.
New York Transformer
Oltronix Co.
Opad Electric
Osborne Electric
PCA Electronics, Inc.
Perfex Corp.
Perkin Engineering
RCA Tube
Raytheon Mfg. Co.
Sangamo Electric
Servo Corp.
Sola Electric
Soreng Products
Sorensen & Co.
Square D Co.
Standard Transf. Corp.
Sterling Transf. Corp.
Sylvania Elect. Prods.
Tartak Electronics, Inc.
Texas Insts., Inc.
Thermador Electcl. Mfg. Co.
Thordarson Meissner
Torwico Electronics
Transformer Engrs.
Transformers, Inc.
Trenton Transf. Corp.
Triad Transf. Corp.
United States Electronics
United Transf. Corp.
Varo Mfg. Co.
Vibration Research Labs.
Viking Electric
Westinghouse Electric

TRANSFORMERS, Pulse

Acme Electric
Acro Products
Aerovox Corp.
Aircraft-Marine Prods.
Aircraft Transf. Corp.
Airpax Products
Altec-Lansing
Alto Scientific
Atlantic Transf. Div.
Atlas Engrg. Co.
Audio Devel. Co.
Berkshire Labs.
Burroughs Electronics
Caledonia Electronics
Calif. Magnetic Cont. Corp.
Carad Corp.
Chicago Std. Transf. Corp.
Colin Campbell Co.
Communication Access. Co.
Detectolab, Inc.
Dietz Design & Mfg.
Dilectron Div.
Dormeyer Industries
DuMont Labs., Allen B.
Electronic Transf. Co.
ESC-Corp.
Freed Transf. Co.
GE, Apparatus Sales
Gordos Corp.
Goslin Elect. & Mfg. Co.
Gramer-Halldorson
Gudeman Co.
Hycor Company
Jacobs Instr. Co.
Kenyon Transf. Co.
Keystone Products
Lab. for Electronics
Levinthal Electronic Prods.
Magnatran Inc.
Magnavox Co.
Magnetic Instr. Co.
Magnetic Res. Corp.
Microtran Div.
Miller Instruments
NJE Corp.
NYT Electronics, Inc.
Natl. Aircraft Corp.
Osborne Electric
PCA Electronics
Peerless Div., Altec
Polyphase Instr. Co.
Raytheon Mfg. Co.
Reed & Reese
Sprague Electric
Sterling Transf. Corp.
Technitrol Engrg. Co.
Tektronix, Inc.
Texas Insts., Inc.
Thermador Electcl. Mfg. Co.
Thordarson-Meissner
Transformer Engrs.
Transformers, Inc.
Triad Transf. Corp.
Underwood Corp.
United States Electronics
United Transf. Corp.
Valor Electron. Comps.
Viking Electric
Westinghouse Electric
Wheeler Insul. Wire, Inc.

TRANSFORMERS, Saturable, see Amplifiers, Magnetic

TRANSFORMERS, Split Core

Aircraft Transformer
Airdesign, Inc.
Airpax Products
Allied Radio
Altec-Lansing
Annis Co., R. B.
Assembly Products
Audio Devel. Co.
Ballastran Corp.
Basler Electric
Better Coil & Transfs.
Bristol Co.
Calif. Magnetic Cont. Corp.
Carad Corp.
Chapman Labs.
Chicago Electronic
Chicago Std. Transf. Corp.
Colin Campbell Co.
Del Electronics
Dietz Design & Mfg.
Electronic Transf. Co.
Esterline-Angus
Freed Transf. Co.
GE, Apparatus Sales
Goslin Elect. & Mfg. Co.
Gramer-Halldorson
H-D Elect. Co.
Kenyon Transf. Co.
Keystone Products
Knopp Inc.
Langevin Mfg. Corp.
Magnetic Amplifiers Inc.
Magnetic Instr. Co.
Mechaponents Div.
Microtran Div.
Miller Instruments
NYT Electronics, Inc.
Natl. Aircraft Corp.
New York Transf. Co.
Osborne Electric
PCA Electronics
Physics Research
Raytheon Mfg. Co.
Roller-Smith Co.
Rubicon Co.
Sangamo Electric
Sorensen & Co.
Southw. Ind. Electronics
Standard Transf. Corp.
Sterling Transf. Corp.
Sylvania Elect. Prods.
Tartak-Electronics, Inc.
Thermador Electcl. Mfg. Co.
Thordarson-Meissner
Transformers, Inc.
Trenton Transf. Corp.
United Transf. Corp.
Viking Electric
Wheeler Insul. Wire, Inc.

TRANSFORMERS, Ultrasonic

Acro Products
Airpax Products
Atlantic Transf. Div.
Atlas Engrg. Co.
Audio Devel. Co.
Calif. Magnetic Cont. Corp.
Communication Access. Co.
Corbett Science Labs.
Electronic Transf. Co.
Ferranti Electric
Freed Transf. Co.
GE, Apparatus Sales
Goslin Elect. & Mfg. Co.
Gramer-Halldorson
Hycor Div.
Kenyon Transf. Co.
Mechaponents Div.
Microtran Div.
Miller Instruments
NYT Electronics
Natl. Aircraft Corp.
Raytheon Mfg. Co.
Sterling Transf. Corp.
Texas Insts., Inc.
Thermador Electcl. Mfg. Co.
Transformers, Inc.
Triad Transf. Corp.
United Transf. Corp.

TRANSFORMERS, Variable, including Auto-transformers

Acme Electric
Aerovox Corp.
Aircraft Transformer
Airdesign, Inc.
Airpax Products
Allied Control Co.
Atlas Engrg. Co
Basler Electric
Better Coil & Transfs.
Burrell Corp.
Cambridge Thermionic
Carad Corp.
Chicago Electronic Engrg.
Chicago Std. Transf. Corp.
Coast Coil Co.
Colin Campbell Co.
Crow Electri-Craft Corp.
Del Electronics
Dormeyer Industries
Dormitzer Elect. & Mfg.
Electronic Transf. Co.
Freed Transf. Co.
GE, Apparatus Sales
General Radio
General Transformer
Gramer-Halldorson
Hevi-Duty Electric Co.
Jeffries Transf. Co.
Langevin Mfg. Co.
Magnatron Inc.
Microtran Div.
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Natl. Aircraft Corp.
Osborne Electric
Permoflux Corp.
Perkin-Elmer Corp.
Pimex, Inc.
Raytheon Mfg. Co.
Sorensen & Co.
Standard Elect. Prods.
Standard Piezo
Sterling Transformer
Superior Electric
Tartak Electronics
Tech. App. Builders
Thermador Electcl. Mfg. Co.
Thordarson-Meissner
Tracerlab Inc.
Trenton Transf. Corp.
Triad Transf. Corp.
United States Electronics
United Transf. Corp.
Westinghouse, X-Ray

TRANSFORMERS, Variable, Voltage Testing

Acme Electric
Aircraft Transf. Corp.
Airdesign, Inc.
Allied Control Co.
Atlas Engrg. Co.
Basler Electric
Better Coil & Transformer
Calif. Magnetic Cont. Corp.

When Using This Guide look under the variable, e.g., Pressure Gages (not Gages, Pressure); or look under the noun—Magnets, Permanent (not Permanent Magnets).

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Mod.	Imp.	Rise Time	Percent Droop 1µs	2µs	10µs	Price
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PT-1E encapsulated						10.90
PT-2	100	.04µs	20	30	70	8.95
PT-3	120	.03µs	20	40	75	5.95
PT-100 9-pin noval						10.00

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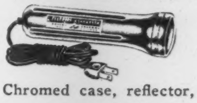

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Merit Transf. Co.
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Natl. Aircraft Corp.
Opad Electric
Pacific Transducer Corp.
Perkin-Elmer
Phen-Trols, Inc.
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Standard Transf. Corp.
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United States Electronics
Techn. App. Builders
Thermador Electcl. Mfg. Co.
Thordarson-Meissner
Trenton Transf. Corp.
United States Electronics
United Transf. Corp.
Weston Elect. Inst.

TRANSFORMERS, Voltage Regulating, see Transformers, Constant Voltage

TRANSISTOR TESTING SETS

Aero Electronics
Amer. Electronic Labs.
Baird Assocs.-Atomic Instr.
El Mec Labs.
Electronic Res. Assocs.
Fretco, Inc.
GE, Electronics Div.
Genl. Transistor Corp.
Kay Electric
Kahle Engrg. Co.
Magnetic Amplifiers, Inc.
Measurements Corp.
Natl. Aircraft Corp.
Naybor Labs, E. V.
Norden-Ketay
Owen Labs.
Polyphase Instr. Co.
Scientific Specialties
Transval Engrg. Corp.
Weber Aircraft Corp.

TRANSISTORS

Amperex Electronic
Bendix, Red Bank
Bogue Electric
CBS-Hytron Div.
Centralab
GE, Electronics Div.
General Transistor Corp.
Germanium Prods. Corp.
Hughes Prods. Div.
Industro, Inc.
Internat. Std. Trading
Lansdale Tube Co.
Mallory & Co., P. R.
Minneapolis-Honeywell
Natl. Aircraft Corp.
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Philco Corp.
Radio Receptor Co.
Raytheon Mfg. Co.
Sprague Electric
Sylvania Elect. Prods.
Texas Insts., Inc.
Transistor Products
Transitron Electronics
Tung-Sol Electric
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TRANSITS., Engineer's, see Surveying Instruments

TRANSITS, Pocket

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Berger & Sons
Dietzgen Co.
Garlynn Engrg. Co.
Graf-Apsco
Gurley, W.&L.E.
Keuffel & Esser
Leupold & Stevens
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Mico Instr. Co.
Suverkrop Instruments
United States Blue Print
Warren-Knight
White Co., Inc.
Wild-Heerbrugg

TRANSMITTERS, see Telemetering, also Pressure Differential Transmitters, also Temperature Transmitters, etc.

TRIMMERS, Capacitor, see Capacitors

TRIPOLI

Dixon, Inc., William
Harshaw Chemical Co.
Lea Mfg. Co.
Modern Tech. Supply
Newall Mfg. Co.
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Sickles & Sons
Wagner Co., Inc., C.A.

TRUCK-MILEAGE RECORDERS, see Mileage Indicators

TRUCK-TIME and/or MILEAGE RECORDERS, see Mileage Indicators

TUBE FITTINGS, see Fittings

TUBE TESTERS, Electron

Bendix, Cincinnati Div.
Chatham Electronics Div.
Chicago Indust. Instr. Co.
Electronic Instr. Co.
Electronic Measmts. Corp.
Hickok Electcl. Instr. Co.
Jackson Electcl. Instr. Co.
Manson Labs.
Philco Corp.
Precision Apparatus Co.
Radio City Prods.
Reiner Electronics
Sensitive Res. Instr.
Simpson Electric
Transvision, Inc.
Triplett Electcl. Instr.

TUBE TESTING MACHINES, see Pipe and Tube Testing Machines

TUBES, Ballast, see Current Regulators

TUBES, Bolometer, see Radiation Pickups

TUBES, Cathode Ray

Amer. Elite Inc.
CBS-Hytron Div.
DuMont Labs., Allen B.
Electronic Tube Corp.
Farnsworth Electronics
Ferranti Electric
GE, Tube Dept.
Haydu Brothers
Hughes Prods. Div.
Industro, Inc.
Lansdale Tube Co.
North Amer. Philips
Owens-Illinois Glass
Philco Corp.
Pioneer Electronics
Raytheon Tube Div.
Sylvania Elect. Prods.
Tung-Sol Electric
Vacuum Tube Products
Waterman Products

TUBES, Discharge, Gas and Vapor, including Argon, Mercury, Neon, Sodium, etc.

Amer. Instr. Co.
Amer. Optical
Amglo Corp.
Amperex Electronic Corp.
Anton Electronic Labs.
Aristo Grid Lamp Prods.
Baird Assocs.-Atomic Instr.
Bausch & Lomb
Bendix, Eclipse-Pioneer
Bendix-Friez
Bendix, Red Bank
Bomac Labs.
Brit, Electronic Sales Co.
Bush Assocs., G. F.
Central Scientific
CGS Labs.
Chatham Electronics Div.
Continental Electric
Cooper-Hewitt
DuMont Labs., Allen B.
Edmund Scientific
Electronic Products
Electrons, Inc.
Ferranti Electric
Fish-Schurman
Fredericks, George
Gaertner Scientific
Gates & Co., George W.
GE, Lamp Dept.
GE, Tube Dept.
General Physical Lab.
Gordos Corp.
Greiner Glassblowing
Hanovia Chem. & Mfg. Co.
Haydu Brothers
Huggins Labs.
Industro, Inc.
Internat. Std. Trading
Jarrell-Ash
Kemlite Labs.
Lansdale Tube Co.
Leitz, Inc.
Machlett & Son
Menlo Research Lab.
Mico Instr. Co.
Nuclear Corp. of Amer.
Owens-Illinois Glass
Pfaltz & Bauer
Pioneer Electronics
Precise Measmts. Co.
Radiation Counter Labs.
Superior Air Prods.
Sylvania Elect. Prods.
Tube Light Engrg. Co.
Ultra-Violet Prods.
Uniform Tubes
United Electronics
Universal X-Ray Prods.
Vacuum-Tube Prods.

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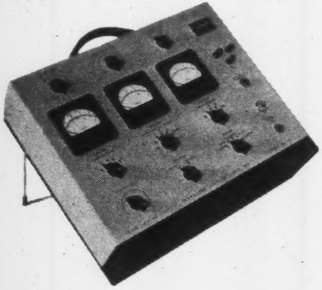
Type 210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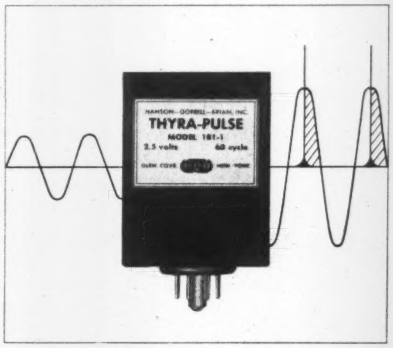

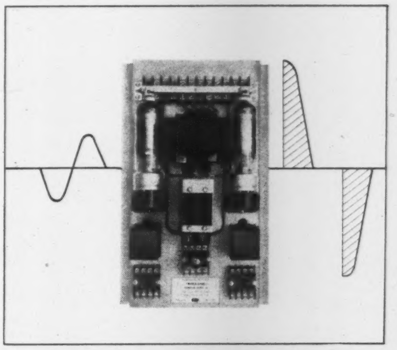

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Victoreen Instr. Co.
Zeiss, Inc., Carl

TUBES, Electrometer

Ferranti Electric
GE, Tube Dept.
Pioneer Electronics
Raytheon Tube Div.
Sylvania Elec. Prods.
Victoreen Instr. Co.

TUBES, Electron, Vacuum

Airborne Instr. Co.
Amer. Elite, Inc.
Amperex Electronic
Amperite Co.
Anton Electronic Labs.
Backus Novelty Co.
Bendix, Eclipse Pioneer
Bendix, Red Bank Div.
Bomac Labs.
CBS-Hytron Div.
Central Scientific
Chatham Electronics Div.
Consolidated Vacuum
Continental Corp.
Continental Electric
Cooper-Hewitt
DuMont Labs., Allen B.
Dunlee Corp.
Eitel-McCullough
Electronic Products
Electrons, Inc.
Federal Telephone & Radio
Ferranti Electric
Fredericks, George E.
GE, Electronics Div.
GE, Tube Dept.
General Scientific Corp.
Gordos Corp.
Greiner Glassblowing
Huggins Labs
Industro, Inc.
Ken-Rad Tube & Lamp
Lansdale Tube Co.
Lectronic Research
Lewis & Kaufman
Litton Industries
Machlett Labs.
Magnavox Co.
Microwave Assocs., Inc.
North Amer. Philips
Nuclear Corp. of Amer.
Passaic Analytical Labs.
Philadelphia Scientific
Philco Corp.
Pioneer Electronics
Raytheon Tube Div.
RCA Tube
Ronar, Inc.
Scientific Glass App.
Sorenson & Co.
Sperry Gyroscope
Standard Arcturus
Sylvania Elect. Prods.
Thermosen, Inc.
Tung-Sol Electric
United Electronics
Universal X-Ray Prods.
Vacutron, Inc.
Vacuum Tube Products
Varian Assocs.
Victoreen Instr. Co.
Walker-Jamieson
Western Radiation
Wheelco Instr. Div.

TUBES, Geiger-Mueller (see also Counters, G-M)

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Anton Electronic Labs.
Baird Assocs.-Atomic Instr.
Beckman Instrument
Bendix Aviation
Detectolab, Inc.
Electronic Prods.
Forro Scientific
GE, Electronics Div.
General Radio
Glasscraft Co.
Industro, Inc.
Instruments Inc.
Landsverk Electrometer
Leighton Labs.
NRD Instr. Co.
North Amer. Philips
Nuclear-Chicago
Nuclear Corp. of Amer.
Nuclear Devel. Lab.
Nucleonic Co. of Amer.
Pioneer Electronics
Radiation Counter Labs.
Raytheon Tube Div.
Sylvania Elect. Prods.
Technical Assocs.
Tracerlab Inc.
Universal Atomics Corp.
Victoreen Instr. Co.
Western Radiation Lab.
Wood Counter Lab., N.

TUBES, Glow, see Tubes, Discharge

TUBES, Ignitron

Amperex Electronic
GE, Tube Dept.
Industro, Inc.
Lectronic Research
North Amer. Philips
Pioneer Electronics
Sylvania Electr. Prods.
Westinghouse Electric

TUBES, Klystron

Amperex Electronics
Arrow Electronics
Bendix, Red Bank
Bomac Labs.
Eitel-McCullough
GE, Tube Dept.
Industro, Inc.
Internat. Std. Trading
Lectronic Research
Marconi Instruments
Nuclear Corp. of Amer.
Polarad Electronics
Sylvania Elect. Prods.
Techn. App. Builders
Varian Assocs.

TUBES, Lighthouse

Amperex Electronic
Bomac Labs.
GE, Tube Dept.
Industro, Inc.
Machlett Labs.

TUBES, Magnetron

Amperex Electronic
GE, Tube Dept.
Haydu Brothers
Industro, Inc.
Lectronic Research
Marconi Instruments
Microwave Assocs.,
North Amer. Philips
Nuclear Corp. of Amer.
Sylvania Electr. Prods.

TUBES, Nessler

Ace Glass
Bellco Glass
Central Scientific
Fischer & Porter Co.
Fish-Schurman
Fisher Scientific
Greiner Glassblowing
Hellige, Inc.
Kimble Glass
Kontes Glass
LaMotte Chemical Prods.
Owen-Illinois Glass
Podbielniak, Inc.
Scientific Glass App.
Specialty Glass Co.

TUBES, Oil Centrifuge, see Oil Centrifuge Tubes

TUBES, Photosensitive including Phototubes and Photocells

Bradley Labs.
Continental Electric
De-Tec-Tronic Corp.
DuMont Labs., Allen B.
Electron-Radar Prods.
Eby Mfg. Co., Inc.
Farnsworth Electronics
Fredericks, George E.
G-M Labs.
GE, Tube Dept.
General Scientific
Gordos Corp.
Hupp Electronics
Industro, Inc.
Instr. Devel. Labs.
International Rectifier
Internat. Std. Trading
Lectronic Research
Phoenix Prec. Instr.
Pioneer Electronics
Precise Measmts. Co.
Precision Products
RCA Tube
Ripley Co.
Rudolph & Sons
Scientific Specialties
Sylvania Elect. Prods.
Tracerlab Inc.
Vacutron, Inc.
Walker-Jamieson
Western Radiation Lab.
Worner Electronic Devices

TUBES, Pitot, see Pitot Tubes

TUBES, Polariscope

Amer. Instr. Co.
Bausch & Lomb
Central Scientific
Fecker, J. W.
Gaertner Scientific
Hellige, Inc.
Jarrell-Ash
Koehler Instr. Co.
Precision Scientific
Rudolph & Sons, O. C.
Sargent & Co.
Scientific Glass App.

TUBES, Precision-Bore, see Tubing, Precision Bore

TUBES, Pyrometer Protection, see Thermowells

TUBES, Spectrum, see Spectrum Tubes

TUBES, Travelling Wave (see also Microwave Equipment)

Bomac Labs.
Federal Telephone & Radio
GE
Martin & Co., H. S.
Raytheon Mfg. Co.
Sperry Gyroscope Div.
Sylvania Elect. Prods.

TUBES, Thyratron

Amperex Electronic
Arrow Electronics
Bendix, Red Bank
Bomac Labs.
Chatham Electronics Div.
DuMont Labs., Allen B.
Eitel-McCullough
Electrons, Inc.
GE, Tube Dept.
Industro, Inc.
Lectronic Research
Machlett Labs.
Nuclear Corp. of Amer.
Raytheon Tube Div.
Sylvania Electr. Prods.
Techn. App. Builders
United Electronics

TUBES, Ultra-Violet Light, see Light Sources

TUBES, Vacuum, see Tubes, Electron, Vacuum

TUBES, Venturi, see Venturi Tubes

TUBES, Voltage Regulator, see Tubes, Discharge; also Current Regulators

TUBES, X-ray

Amer. Instr. Co.
Amperex Electronic Corp.
Baird Assocs.-Atomic Instr.
Corning Glass Works
Dunlee Corp.
Eureka X-Ray Tube
Ferranti Electronic
GE, X-Ray Dept.
High Voltage Engrg. Co.
Jarrell-Ash
Kelley Koett Mfg.
Machlett Labs.
North Amer. Philips
Picker X-Ray
Ronar, Inc.
Standard Arcturus
Stoelting Co., C. H.
Tracerlab Inc.
Universal X-Ray Prods.
Westinghouse Electric
Westinghouse X-Ray Co.
Wyland George

TUBING, Armor, see Tubing, Capillary Casing; also Tubing, Flexible, Stainless Steel

TUBING, Bourdon

American Brass Co.
Mackenzie Walton Co.
Precision Tube Co.
Preis Engrg. Mach.
Seegers Mfg. Co.
Servonic Instruments
Summerill Tubing Co.
Superior Tube Co.

TUBING, Capillary

Ace Glass
Amer. Brass
Autoclave Engrs.
Bishop & Co., J.
Corning Glass Works
Crystal Glass Tube
Edna Lite Co.
Everett Products
Fischer & Porter Co.
Fish-Schurman
Flexonics Corp.
General Plate Co.
Greiner Glassblowing
Johnson Engrg. Co.
Kontes Glass
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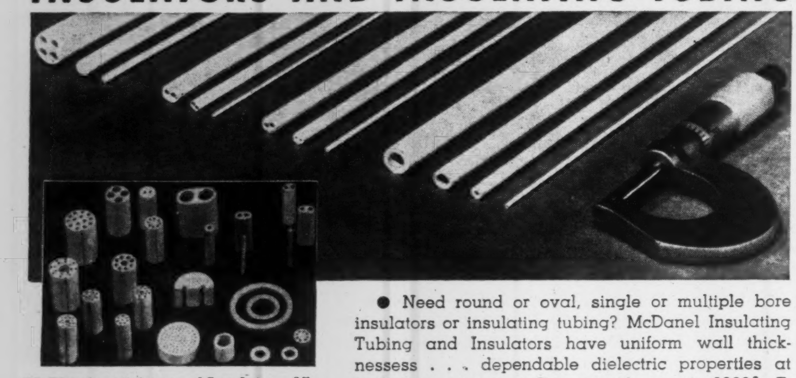

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☐ The Automatic Factory by Stephen A. June 1.50
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Preis Engrg. Mach.
Revere Copper & Brass
Summerill Tubing Co.
Superior Tube Co.
Trerice Co., H. O.
Uniform Tubes
Wolverine Tube Div.

TUBING, Capillary Casing

Amer. Brass Co.
Flexonics Corp.
Mackenzie Walton
Packless Metal Hose
Penna. Flexible Metallic
Uniform Tubes
Universal Metal Hose

TUBING, Ceramic

Amer. Lava Corp.
Bristol Co.
Centralab Div.
Crowley & Co., H. L.
Du-Co Ceramics
Fish-Schurman
General Ceramics
Lapp Insulator Co.
McDanel Refr. Porcelain
Saxonburg Ceramics
Steatite Div.
Stupakoff Div.
Superior Steatite

TUBING, Fibre

Auburn Mfg. Co.
Continental Diamond Fibre
Insulation Mfrs. Corp.
Mitchell Rand Insulating
Natl. Vulcanized Fibre
Paramount Paper Tube
Precision Paper Tube
Spaulding Fibre
Wilmington Fibre

TUBING, Flexible, Brass, Steel

Amer. Brass Co.
Bendix, Eclipse-Pioneer
Breeze Corporations
Bridgeport Brass Co.
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Flexonics Corp.
Packless Metal Prods.
Penna. Flexible
Seamlex Co., Inc.
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Univ. Metal Hose
Weatherhead Co.

TUBING, Flexible, Multitube

Crescent Insul. Wire
Insulation Mfrs. Corp.
Moore & Co., Samuel
Polymer Corp.

TUBING, Flexible, Stainless Steel

Alloy Tube Div.
Amer. Brass Co.
Bendix-Eclipse Pioneer
Bishop & Co., J.
Breeze Corporations
Clifford Mfg. Co.
Flexonics Corp.
High Pressure Equipt. Co.
Packless Metal Prods.
Penna. Flex. Met. Tubing
Schnitzer Alloy Prods.
Seamlex Co.
Uniform Tubes
Univ. Metal Hose

TUBING, Fused Quartz

Ace Glass
Amersil Co.
Fish-Schurman
GE, Lamp Dept.
Gordon Co., Claud S.
Hanovia Chem.
Machlett & Son
Prec. Glass Prods. Co.
Thermal Syndicate
Torrance Glass & Color

TUBING, Glass Fibre, Insulation

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Bache & Company, Semon
Bentley, Harris Mfg. Co.
Birnbach Radio
Brand and Co., William
Continental-Diamond Fibre
Hitemp Wires, Inc.
Insulation Mfrs. Corp.
Mica Insulation
Spaulding Fibre

TUBING, Laminated Phenolic

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Bakelite Corp.
Continental-Diamond Fibre
Formica Co.
GE, Chem. Dept.
General Winding Co.
Mica Insulator
Natl. Vulcanized Fibre
Precision Paper Tube
Richardson Co.
Spaulding Fibre
Stone Paper Tube
Synthane Corp.
Wilmington Fibre

TUBING, Low Coefficient of Expansion

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Amer. Lava Corp.
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Centralab Div.
Corning Glass
Du-Co Ceramics
Fansteel Metallurgical
Fish-Schurman
Glasscraft Co.
Hitemp Wires, Inc.
Kontes Glass
Phoenix Prec. Instr.
Prec. Glass Prod. Co.
Precision Tube
Stupakoff Div.
Summerill Tubing Co.
Superior Tube Co.
Thermal Syndicate

TUBING, Mica

Auburn Mfg. Co.
Continental-Diamond Fibre
Mica Insulator

TUBING, Miscellaneous, including Hastelloy, Illium, Invar, Kovar, Tantalum

Alloy Tube Div.
Autoclave Engrs.
Bishop & Co., J.
Everett Products
Fansteel Metallurgical
Ferner Co., R. Y.
General Plate Div.
Haynes Stellite
Stupakoff Div.
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Vacuum Res. Co.

TUBING, Nickel, Monel, Inconel

Autoclave Engrs.
Bishop & Co., J.
Driver-Harris Co.
General Plate Co.
Gordon Co., Claud S.
High Pressure Equipt. Co.
Johnson Engrg. Co.
Mackenzie Walton
Metal Goods Corp.
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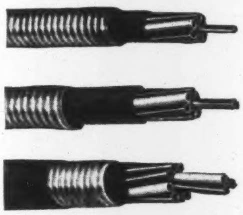

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Stupakoff Div.
Summerill Tubing Co.
Superior Tube Co.
Uniform Tubes, Inc.

TUBING, Paper

Auburn Mfg. Co.
Edmund Scientific Corp.
Insulation Mfrs. Corp.
Paramount Paper Tube
Precision Paper Tube
Ritchie & Co., W. C.
Stone Paper Tube

TUBING, Plastic

Allegheny Plastics
Alloy Tube Div.
Amer. Hard Rubber
Amer. Phenolic Corp.
Auburn Button Works
Auburn Mfg. Co.
Bakelite Corp.
Bel-Art Products
Bentley, Harris Mfg. Co.
Birnbach Radio Co.
Blum & Co., Julius
Brand and Co., William
Carbide & Carbon Chem.
Carroll Co.
Cast Optics
Commercial Plastics Co.
Continental-Diamond Fibre
Crane Packing Co.
Crescent Insul. Wire
Dow Chemical Co.
DuPont
Dura Plastics
Electronic Mechanics
Erie Resistor Corp.
Formica Co.
Garlock Packing Co.
GE
Goodrich Co., B. F.
Goodyear Tire
Hamilton Rubber
Hitemp Wires Inc.
Imperial Brass
Keller Prods.
Mica Insulator
Mitchell Rand Insulating
Monsanto Chemical
Moore & Co., Samuel
Morris Co., J. I.
National Varnished Prods.
Parisian Novelty
Phipps & Bird, Inc.
Polymer Corp.
Precision Paper Tube
Republic Rubber Div.
Resistoflex Corp.
Rex Corp.
Richardson Co.
Spaulding Fibre
Stone Paper Tube
Surprenant Mfg. Co.
U. S. Gasket Co.
U. S. Rubber Co.
Valley-National Corp.
Watertown Mfg. Co.
Weatherhead Co.
Werner Co., Inc., R. D.

TUBING, Precious Metals, including Platinum

Amer. Platinum Works
Baker & Co., Inc.
Bishop & Co., J.
Cohn Mfg. Co., Sigmund
Eisele & Co.
General Plate Div.
Johnson Engrg. Co.
Newall Mfg. Co.
Ney Co.
Secon Metal Corp.
Uniform Tubes, Inc.
Wilson Co., H. A.

TUBING, Precision Bore, Glass, see Glass Tubing

TUBING, Precision Bore, Metal

Bishop & Co., J.
General Plate Div.
High Pressure Equipt. Co.
Mackenzie Walton Co.
Precision Tube Co.
Superior Tube Co.
Torrington Co.

TUBING, Rubber (see also Hose, Rubber)

Aeroquip Corp.
Atlantic India Rubber
Auburn Mfg. Co.
Dixon Inc.
Garlock Packing Co.
General Tire & Rubber
Goodrich Co., B. F.
Goodyear Tire
Hamilton Rubber
Harshaw Chemical
Luzerne Rubber Co.
Machlett & Son
Popper & Klein
RKL Valve & Mfg. Co.
Raybestos-Manhattan, Inc.
Republic Rubber Div.
Resistoflex Corp.
Rubatex Div.
Stokes Molded Prods.
U. S. Rubber Co.
Weatherhead Co.
Werner Co., Inc., R. D.

TUBING SUPPORTS, including Cable Supports, Troughs, etc.

Air Associates
Arlington Aluminum Co.
Instrof Div.

INSTROF CONTINUOUS SUPPORT AND PROTECTION FOR INSTRUMENT TUBING

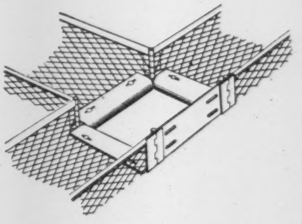
Tubing may readily be run to individual instruments or panels as needed.

Delicate instruments quickly become useless without adequate tubing support. Instrof provides a flexible, simple-to-install system for maximum efficiency and dependability at minimum cost. Famous Pin-Type Coupling available for wide range of standard fittings and runs.

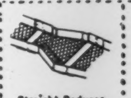
Instrof is a system of Prefabricated Expanded Metal Trough specifically designed for rigid, continuous support and protection of instrument tubing. All parts are hot-dip galvanized for long life. Widths of 3", 6", 9", 12", 18", and 24", lengths of 8', 10', and 12', and a complete line of fittings allow the Instrof system to meet the demands of virtually any plant layout.

Exclusive Pin-Type Coupling speeds installation and reduces labor costs. Just two coupler pins and a bottom plate are needed to complete a connection.

Drop-out is one of many standard fittings that keep an Instrof system flexible, yet simple to install. Expansion is a simple matter with an Instrof system as additional tubing may be laid in existing trough.



INSTROF CORP.
DIVISION T. J. COPE, INC.
Collegeville 21, Pennsylvania



Straight Reducer

Vertical Tee

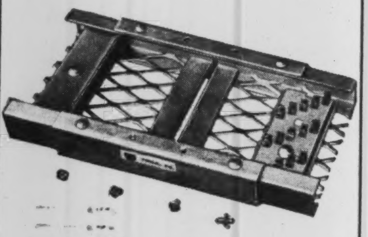
90° Riser Elbow (Inside)

For more information circle **403** on inquiry card.

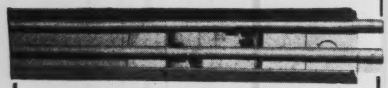
SPECIFY

P-W

for Supporting Instrument Tubing



P-W Manufactures a complete trough system with channel connectors. Drive rivets are used for quick assembly.—Extension Connectors eliminate field cutting—Adjustable connectors for any change in direction or elevation—I Section for long spans—Tube Clips—Cushion Clamps



Raceway to support a limited number of tubes with connectors, elbows, tees, etc.—Bulkhead Bar. P-W systems are available in widths from 1" to 24" and in lengths from 1' to 16'.

Twist-Rack

The Structure To Support Tubetrof . . . Cabletrof . . .
Shelving . . . Conduit . . . Cables . . . Pipe, Etc.

Write today for Bulletin 955-D

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(Representatives to serve you!)

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P-W Industries
Rakit Corp.
Unistrut Products
Weckesser Co.
Wolfe & Mann

TUBING, Varnished or Lacquered

Bentley, Harris Mfg. Co.
Birnbach Radio
Brand and Co., William
Precision Paper Tube

TUNGSTEN

Amer. Electro Metl.
Baker Chem. Co., J. T.
Belmont Smg. & Refg.
Cleveland Tungsten Mfg.
Conn Mfg. Co., Sigmund
Dixon, Inc., Wm.
Electro Metallurgical Co.
Fansteel Metallurgical
GE, Lamp Wire & Phos.
P. R. Mallory & Co.
North Amer. Phillips
Sylvania Elect. Prods.
Tungsten Contact Mfg.
Westinghouse Electric
Wilson Co., H. A.
Willey's Carbide Tool

TUNING FORKS, see Forks, Tuning

TURBIDIMETERS

Amer. Instr. Co.
Boekel & Co.
Bowen & Co.
Cargille, R. P.
Central Scientific
Elect. Eye Equipt. Co.
Ercona Corp.
Ess Instr. Co.
Ferguson Co.
Fisher Scientific
GE, Apparatus Sales
GE, Instr. Dept.
Hallikainen Instruments
Hellige, Inc.
Instrument Devel. Labs.
Klett Mfg. Co.
Kimble Glass
Owens-Illinois Glass
Parr Instr. Co.
Pfaltz & Bauer
Phipps & Bird
Phoenix Prec. Instr.
Photovolt Corp.
Precision Scientific
Process & Instruments
Radioactive Products
Rawson Electcl. Instr.
Rubicon Co.
Sensitive Res. Instr.
Testing Machines, Inc.
Zeiss, Inc., Carl

TURBINE GOVERNORS

Allis-Chalmers
Askania Reg. Co.
Baldwin-Lima-Hamilton
Farris Engrg. Co.
Fisher Governor
Foster Engrg. Co.
GE
GE, Apparatus Sales
Hagan Corp.
Kieley & Mueller
Mason-Neilan Div.
Robertson & Ruth
Shallcross Controls
Stratos Div.
Synchro-Start Products

TWEEZERS, Instrument (see also Tools, Precision)

Baker Co.
Bayside Watch Tool
Dixon, Inc., Wm.
Fineisen, A. R.
Fisher Scientific
GE
General Scientific Equipt.
Graf-Apsco
Grobet File Corp. of Amer.
Jadow Inc., B.
Keller & Co., L. H.
Lindly & Co.
Marshall Co.
Microchemical Service
Micro-Metric Instr.
Modern Techn. Supply
Newall Mfg. Co.
New Jersey Jewelers
Sickles & Sons
Stratex Instr. Co.
Vallorbs Jewels
Win Sales Co.

ULTRASONIC EQUIPMENT, including Generators (see also Flaw Detectors, Ultrasonic; also Transducers)

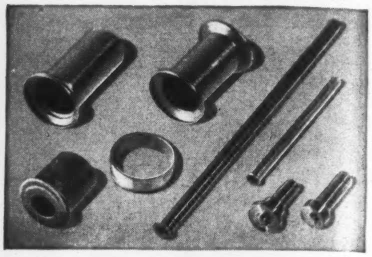
Air Associates
Airborne Insts. Lab.
Ameri. Cystoscope Makers
Atlantic Res. Corp.
Bendix-Pacific
Bendix, Pioneer-Central
Bogue Elect. Mfg. Co.
Branson Insts.
Brush Electronics
Burroughs Corp.
Chesapeake Instr. Corp.
Circo Equipt. Co.
Computer Control
ConRay Corp.
Corbett Science Labs.
Dice Co.
Dyna-Empire, Inc.
Engineering Res. & Dev.
Ercona Corp.
Erdco Engrg.
Freed Transformer
Fruengel, Inc.
GE, Apparatus Sales
General Precision Lab.
General Radio
General Ultrasonic Co.
Genzlinger, Inc.
Gulton Mfg. Corp.
Hall Sonic Engrg. Co.
Hewlett-Packard
Industrial Gauges Corp.
Kahn & Co.
Kay Electric
Kinematic Instr.
Magnaflux Corp.
Massa Labs.
Measurements Corp.
Moore Corp., John B.
Natl. Instr. Labs.
Ostby & Barton Co.
Photocon Research
Radex Corp.
Radioative Prod.
Raytheon Mfg.
Scott, Inc., H. H.
Sierra Electronic Corp.
Sorsensen & Co.
Spellman Television
Sperry Prods.
Std. Electronic Res.
Sunshine Scient. Inst.
Teletronics Lab.
Ultrasonic Corp.
Vibro-Ceramics
Waveform Inc.

ULTRA-VIOLET INDICATORS and/or RECORDERS

Beckman Instrument Co.
Consol. Electrodynamics
Eitzen Co., Louis C.
Engelhard Inc., Charles
Farrand Optical
GE
Hanovia Chem. & Mfg. Co.
Kruger Instruments
McPherson Prec. Insts.
Menlo Research Lab.
Nuclear Chicago
Perkin-Elmer Corp.
Phoenix Prec. Instr. Co.
Pfaltz & Bauer
Photovolt Corp.
Prec. Radiation Insts.
Process & Instruments
Ultra-Violet Prods., Inc.

ULTRA-VIOLET LIGHT SOURCES

American Inst.
Amer. Optical Co.
Amglo Corp.
Aristo Grid Lamp Products
Atlas Electric Devices
Atomic Research Corp.



Precision Tubular Parts . .

Moving Coil Forms

We specialize in the design, tooling and fabrication of tubular metal parts and assemblies to close dimensional tolerances. Moving coil forms for galvanometers is an example.

Range of Sizes: From smaller than hypodermic needles (0.010-in. dia. O.D.) to ⅝-in. dia. O.D.

Materials: Wide range of metals and alloys such as aluminum, copper, nickel, stainless and low carbon steel.

Fabricating Operations: Include beading, flaring, spinning, bending, upsetting, swaging, drawing, reducing, expanding, and combinations of these operations. Also, common machining operations.

To obtain price and delivery information, simply send us a blueprint or sample part, and indicate your quantity requirements. Your inquiry will receive prompt attention, at no obligation on your part, of course.

H&H MACHINE COMPANY
Noble & Jackson Streets
NORRISTOWN, PA.

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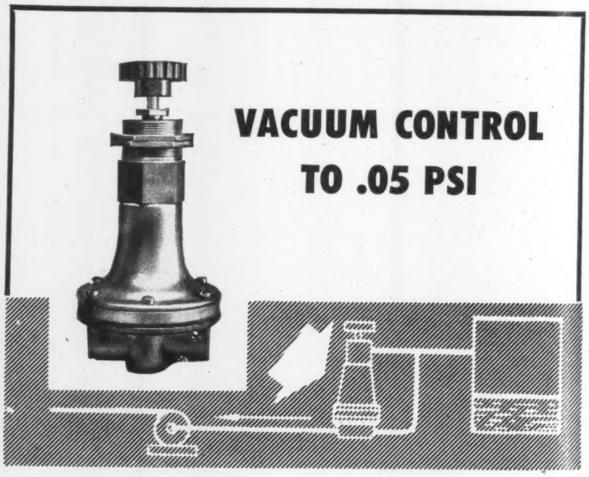
VACUUM CONTROL TO .05 PSI



The Conoflow VH-20 Vacuum Regulator can solve your problem of controlling vacuum in low capacity systems. Ideal for laboratory work, and for test stands, especially where accurate simulation of high altitude conditions is required. Holds absolute pressure to as low as 1 inch ±.05 inches mercury. Provides quick, easy adjustment on dead end or low flow service.

Available from stock in ¼ inch size, of forged brass and stainless steel construction. PRICE $25.00. Discounts for quantities. Instruction bulletin included with order.

Cono-Controls®
FOREMOST
IN FINAL CONTROL ELEMENTS

WRITE FOR BULLETIN H-2 ON PNEUMATIC REGULATORS
CC-60

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Bush Assocs., G. F.
Central Scientifc
Continental Electric
Cooper-Hewitt
Davenport Mfg. Co.
Dietert Co.
Electronic Products
Engineering Res. & Dev.
E & S Optical
Ercona Corp.
Ferner Co.
Fish-Schurman Corp.
Fisher Res. Lab.
Fredericks, George
Gaertner Scient. Corp.
Gates & Co., George W.
GE, Lamp Dept.
Greiner Glassblowing Lab.
Haledy Electronic Co.
Hanovia Chem. & Mfg.
Huggins Labs.
Jarrell-Ash Co.
Kemlite Labs.
Leitz, Inc.
Macbeth Corp.
Magnaflux Corp.
Menlo Research Lab.
Mico Instr. Co.
Pacific Transducer Corp.
Perkin-Elmer
Pfaltz & Bauer, Inc.
Phoenix Prec. Instr. Co.
Photovolt Corp.
Precise Measurements
Prec. Glass Prods. Co.
Quartz Products Co.
Rudolph & Sons, O.C.
Sampson Chem. & Pigment
Stocker & Yale
Switzer Bros.
Sylvania Elec. Prod.
Thermal American Fuzed
Tube Light Engrg. Co.
Ultra-Violet Prods., Inc.
Westinghouse X-Ray Co.

U-TUBE MANOMETERS, see Manometers

VACUUM APPARATUS, including Pumps

Ace Glass
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Bronoptics Co.
Central Scientific Co.
Chicago Apparatus
Consol. Electrodynamics
Consolidated Vacuum
Daigger & Co.
Eberbach & Son Co.
Eitel-McCullough, Inc.
Fisher Scientific Co.
Gast Mfg. Corp.
General Laboratory
Greiner Glassblowing Lab.
High Vacuum Equipt. Corp.
Ingersoll-Rand
Joy Mfg. Co.
Kahle Engrg. Co.
Kontes Glass
Lammert & Mann Co.
Lear, Inc.
Leiman Bros.
Metrogram Corp.
Penna. Pump & Compressor
Phoenix Prec. Instr. Co.
Prec. Scient. Co.
R. K. L. Valve & Mfg. Co.
Red Point Prod., Inc.
Schutte & Koerting Co.
Stokes Mach. Co., F. J.
Vacuum-Electron Engrg.
Vacuum Res. Co.
Vacuum Tube Prods.
Vanton Pump & Equipt.
Wakefield Industries
Welch Mfg. Co., W. M.
Will Corp.
Worthington Corp.

VACUUM BREAKERS

Cash Valve Mfg. Corp.
Dahl Co., G. W.
Foster Engrg. Co.
Jennings Radio Mfg. Corp.
Jordan Corp. Div.
Marine & Indust. Prods.
Schade Valve Mfg. Co.
Watts Regulator Co.

VACUUM GAGES, Discharge

Bristol Co.
Consol. Electrodynamics
Consolidated Vacuum
Distillation Products
High Vacuum Equipt. Corp.
Manning, Maxwell & Moore
National Research
Process & Instruments
RCA Div.
Universal X-Ray Prods.
U. S. Gauge Div.
Vacuum Electronic Engrg.
Vacuum Tube Prods.
Weksler Thermom. Corp.
Welch Mfg. Co., W. M.

VACUUM GAGES, Hot-Wire, Pirani, etc.

Baird Assocs.-Atomic
Central Scientific
Consol. Electrodynamics
Consolidated Vacuum
Continental Electric Co.
Distillation Prods.
Electron-Radar Prods.
Ferguson Co.
Fredericks Co., Geo.
GE, Tube Dept.
General Physical Lab.
Green Rectifier Co.
Hastings-Raydist, Inc.
High Vacuum Equipt. Corp.
Kontes Glass
Macalaster Bicknell
National Research
Process & Instruments
Sylvania Elect. Prods.
Tube Light Engrg. Co.
Universal X-Ray Prods.
Vacuum-Electronic Engrg.
Vacuum Tube Products Co.
Victory Engrg.
Welch Mfg. Co., W. M.
Winslow Co.

VACUUM GAGES, Ionization

Amer. Electronic Labs.
Central Scientific Co.
Consol. Electrodynamics
Consolidated Vacuum
Distillation Products
Eitel McCullough
El-Tronics, Inc.
Fredericks Co., Geo.
GE, Apparatus Sales
GE, Instrument Dept.
GE, Tube Dept.
High Vacuum Equipt. Corp.
National Research
Nuclear Chicago
Nuclear Corp. of Amer.
Precision Scientific
Process & Instruments
RCA Div.
Sierra Electronic Corp.
Stoelting Co., C. H.
Sylvania Elect. Prods.
Universal X-Ray Prods.
Vacuum-Electron Engrg.
Vacuum Tube Prods. Co.
Welch Mfg. Co., W. M.
Winslow Co.

VACUUM GAGES, Liquid-column

American Meter Co.
Amthor Testing Instr. Co.
Bacharach Industrial Insts.
Bailey Meter Co.
Bristol Co.
Consolidated Vacuum
Distillation Prods.
Dwyer Mfg. Co.
Ellison Draft Gage
Ferguson Co.
Foxboro Co.
Gas Appliance Specs.
G E
Greiner Glassblowing Lab.
Jerguson Gage & Valve
King Engrg. Corp.
Kontes Glass
Liquidepth Indicators
Manning, Maxwell & Moore
Meriam Instrs. Co.
Moeller Instr. Co.
Norden-Ketay
Penberthy Injector
Phoenix Prec. Instr. Co.
Pioneer Instrument
Precision Thermom. Co.
Scientific Glass Apparatus
Scientific Instr. Co.
Taylor Instr. Cos.
Technical Equipt. Co.
Todd Scientific
Trerice Co.
Trimount Instr. Co.
Uehling Instr. Co.
Universal X-Ray Prods.
Wallace & Tiernan
Welch Mfg. Co., W. M.
Weston Electrl. Instr.

VACUUM GAGES, McLeod

Ace Glass
Central Scientific Co.
Consol. Electrodynamics
Consolidated Vacuum
Continental Electric
Distillation Prods.
Electronic Products Co.
Ferguson Co.
GE, Tube Dept.
General Physical Lab.
Greiner Glassblowing Lab.
Hays Corp.
Kontes Glass
Macalaster Bicknell Co.
Manostat Corp.
Perfex Corp.
Phoenix Prec. Instr. Co.
Podbielniak, Inc.
Prec. Glass Prods. Co.
Radiation Inst. Dev. Labs.
Scientific Glass Apparatus
Stoelting Co., C. H.
Stokes Mach. Co., F. J.
Todd Scientific
Universal X-Ray Prods.
Wakefield Industries
Welch Mfg. Co., W. M.

VACUUM GAGES, Molecular

GE, Apparatus Sales
Welch Mfg. Co., W. M.

VACUUM GAGES, Thermocouple

Central Scientific Co.
Consol. Electrodynamics
Consoliated Vacuum
Distillation Products
Fredericks Co., George
GE, Apparatus Sales
GE, Instrument Dept.
Greiner Glassblowing Lab.
Hastings-Raydist, Inc.
High Vacuum Equipt. Corp.
National Research
Process & Instruments
RCA Div.
Scientific Specialties
Sylvania Elect. Prods.
Universal X-Ray Prods.
Vacuum-Electronic Engrg.
Vacuum Tube Prods. Co.
Welch Mfg. Co., W. M.
Winslow Co.

VACUUM, HIGH (below 1 mu), CONTROLLERS, INDICATORS and RECORDERS

Aeromarine Instr. Co.
Alfred Electronics
Askania Reg. Co.
Assembly Prods., Inc.
Baird Assocs.-Atomic
Bristol Co.
Consol. Electrodynamics
Consolidated Vacuum
Continental Elec. Co.
Distillation Products
Electronic Prods. Co.
Fredericks Co., Geo.
Fulton Sylphon Div.
GE
General Physical Lab.
Green Rectifier Co.
High Vacuum Equipt. Corp.
National Research
Process & Instruments
Shallcross Controls
Squires Co., C. E.
Stoelting Co., C. H.
Taylor Instr. Cos.
Universal X-Ray Prods.
Vacuum-Electronic Engrg.
Vacuum Tube Prods. Co.
Weksler Thermom. Corp.

VACUUM INDICATORS and/or RECORDERS

Aeromarine Instr. Co.
Alfred Electronics
American Meter Co.
Ashton Valve Co.
Askania Reg. Co.
Assembly Prods., Inc.
Bailey Meter Co.
Baird Assocs. Atomic
Bristol Co.
Central Scientific Co.
Colvin Labs., Inc.
Conoflow Corp.
Consol. Electrodynamics
Consolidated Vacuum
Continental Electric
DeZurik Shower Co.
Dickson Co.
Distillation Products
Elect. Auto-Lite Co.
Electronic Prods.
Ellison Draft Gage
Engineering Res. & Devel.
Esterline-Angus Co.
Fischer & Porter Co.
Fish-Schurman Corp.
Foxboro Co.
Fredericks Co., George
Fulton Sylphon Div.
General Controls Co.
GE Instrument Dept.
General Physical Lab.
Green Rectifier Co.
Gotham Instr. Div.
Hastings-Raydist Co.
Hays Corp.
Helicoid Gage Div.
High Vacuum Equipt. Corp.
Kahn & Co.
Kistler Instr. Co.
Kollsman Instr. Div.
Lear, Inc.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Mason-Neilan Div.
Meriam Instrument
Minneapolis-Honeywell
  Indust. Div.
Moeller Instr. Co.
Moore Products
National Research
Penn Insts. Div.
Potter Co.
Precision Scientific
Precision Thermom. Co.
Process & Instruments
Rawson Electrical Instr.
Republic Flow Meters
Rochester Mfg. Co.
Schauer Mfg. Co.
Schwien Engineering
Scientific Glass App.
Scientific Instr. Co.
Shallcross Controls
Statham Labs.
Stoelting Co., C. H
Stokes Mach. Co., F. J.
Taylor Instr. Companies
Technical Equipt. Co.
Trerice Co.
Uehling Instr. Co.
U. S. Gauge Div.
Universal X-Ray Prods.
Vacuum Electronic Engrg.
Vacuum Tube Products Co.
Victory Engrg.
Wallace & Tiernan
Weksler Thermom. Corp.
Weston Electcl. Instr.
Winslow Co., Inc.

VACUUM REGULATORS

Conoflow Corp.

VACUUM SPECTROGRAPHS, see Spectrographs

VACUUM TUBE BRIDGES, see Bridges, Electrical, Vacuum Tube

VACUUM TUBE RELAYS, see Relays, Electronic

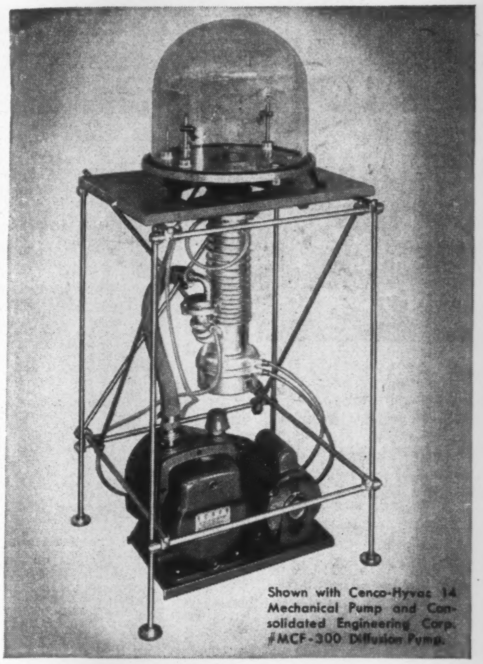
VACUUM TUBE VOLTMETERS

Acton Labs
Aerovox Corp.
Allied Radio Corp.
Amer. Chronoscope Corp.
Ballantine Labs.
Barber Labs., Alfred
Beckman Instruments
Beta Electric Corp.
Bradshaw Instruments
Burlington Instrument
Cambridge Instr. Co.
Chicago Indust. Instr. Co.
Clippard Instr. Lab.
Clough-Brengle Co
Co-decign Corp.
Columbus Products Corp.

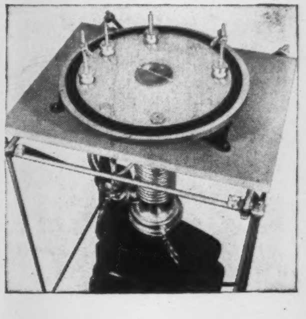
cenco®

offers a NEW and greatly improved PUMP PLATE

for vacuum evaporation or melting



Shown with Cenco-Hyvac 14 Mechanical Pump and Consolidated Engineering Corp. #MCF-300 Diffusion Pump.



This new steel pump plate is designed for experimental vacuum evaporation and sputtering of metals, vacuum melting of metals, vacuum impregnation, and for small quantity production. It also facilitates testing electronics components as required in the study of high altitude projectiles.

Direct connection may be made to a mechanical vacuum pump or to an oil diffusion pump backed by a mechanical unit.

No. 94206 Cenco Pump Plate without accessories, #1 for connection to mechanical pump, **$155.00;** #2 for connection to an oil diffusion pump, **$157.50.**

Attend the National Symposium on Vacuum Technique, Sheraton Hotel, Chicago, October 10, 11 and 12, 1956.

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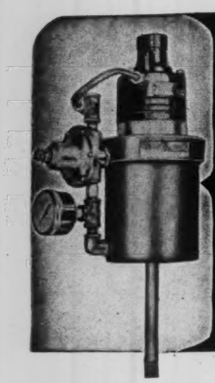


Up to 5 times faster response with
NEW CONOFLOW PNEUMATIC CYLINDER MOTORS
for
THROTTLING CONTROL

The New B-50 Series of pneumatic cylinders for throttling control service operate on air pressures up to 100 psig and are capable of repositioning accuracies of 1/500 part of total stem travel. Simplified one-piece piston construction features graphite impregnated "O" ring seals and a piston positioner integrally mounted in the head plate. Extra sensitive, speedy and stable—because of minimum friction and precisioned aluminum design.

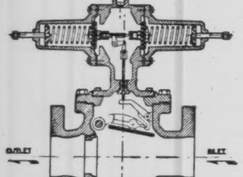
Many applications include positioning electrical components, variable speed drives, rubber pinch valves, etc. Available in 4", 6" and 8" diameters with 3" and 4" stem travels. Furnished complete with cushion-loading regulator and gauge, fully piped, ready for installation.

Write for bulletin B-50

CONOFLOW CORPORATION
2100 Arch St., Phila. 3, Pa.

ConoControls

For more information circle 408 on inquiry card.



THERE IS A Security
AUTOMATIC SHUT-OFF VALVE FOR EVERY REQUIREMENT

Security Valves will provide automatic shut-off in the event of increase in pressure, decrease in pressure, or on pressure differential. Solenoid controls for remote control furnished as required. May be actuated by direct line pressure or by static line control. Manual reset for oil, gas, or chemical service in accordance with API and ASME specs.

MODEL "IDPS-H" (closes on Increase OR Decrease in Pressure; Static line control, High pressure application). Described in detail in Bulletin 227-C.

Write for New Comprehensive Bulletin

SECURITY VALVE CORP.
541 W. GARFIELD, GLENDALE 4, CALIF.
CHAPMAN 5-5725

SECURITY VALVE

For more information circle 409 on inquiry card.

Computer Co. of America
Daven Co.
Donner Scientific
Electomic Mechanisms, Inc.
Electro Prods. Labs.
Electronic Dev. Lab.
Electronic Engrg.
Electronic Instr. Co.
Electronic Mfg. Co.
Electronic Measmts. Corp.
Electronic Measmts. Co.
Electro Products Lab.
Endevco Corp.
Federal Telephone
Feiler Engineering
Fluke Mfg. Co.
Freed Transformer
GE
General Radio Co.
Gertsch Prods,, Inc.
Hewlett-Packard Co
Hickok Elect.-Instrument
Industrial Control Co.
Industrial Test
Instrument Electronics
Jackson Elect. Co.
Jennings Radio Mfg. Corp.
Kay-Lab.
Keithley Insts., Inc.
Marconi Instruments
Measurements Corp.
Mercury Electronic Co.
Millen Mfg. Co.
Miller, M. C.
Millivac Instruments
Minnesota Electronics
Phaostron Co.
Philco Corp.
Precise Development
Precison Apparatus Co.
Precision Electronics
Radio City Prods. Co.
RCA Tube Div.
Reiner Electronics
Scientific Specialties
Scott, Inc., Hermon
Shallcross Mfg. Co.
Shasta Div., Beckmen
Sherron Metallic
Sierra Electronic Corp.
Simpson Electic
Southwestern Ind. Elec.
Supreme, Inc.
Sylvania Elect. Prods.
Technology Instrument
Televiso Co.
Trio Labs., Inc.
Triplett Elect. Instr. Co.
Triumph Mfg. Co.
United Optical Mfg.
Victoreen Instrument
Waveforms, Inc
Western Electroc-Acoustics
Weston Electcl. Instr.
Williamson Dev.
Yonkers Industries

VACUUM TUBES, see Tubes, Electron, Vacuum

VALVE-OPERATING DEVICES, Electric Motor

Aeronaut Div., Robertshaw-Fulton
AiResearch Mfg. Co.
Airmatic Valve
Allis-Chalmers
American Kloeckner
Assoc. Valve & Engrg.
Autom. Temp. Control Co.
Baldwin-Lima-Hamilton
Barber-Colman Co
Barksdale Valves
Beck Co.
Bendix Eclipse-Pioneer
Bendix, Pacific
Bristol Co.
Brooke Engrg. Co.
Cameron Iron Works
Clark Cooper Co.
Cleveland Fuel Equip.
Climax Div.
Conoflow Corp.
Continental Equip. Co
Control Components Co.
Counter & Control Corp.
Cramer Controls Corp.
Cutler-Hammer, Inc.
DeZurik Shower
Dickson Co.
Edward Valves
Fischer & Porter Co.
Foxboro Co.
General Controls Co.
GE
Gen. Regulator Corp.
Hays Corp.
Hydromatics Inc.
Jenkins Bros.
Johnson Service Co.
Keckley Co., O. C.
Lear, Inc.
Leeds & Northrup
Lumenite Electronic
Magnetic Industries
Manning, Maxwell & Moore
McAlear Mfg. Co.
Minneapolis-Honeywell
Natl. Aircraft Corp.
National Controls
Penfield Mfg. Co.
Philadelphia Gear Works
Reliance Instr. Mfg. Corp.
Republic Flow Meters
Robinette Co., W. C.
R-S Products
Sangamo Electric
Schwien Engrg.
Shallcross Controls
Sparton Cont. Systems
Techniflex Corp.
Trans-Sonic Inc.
Vacuum Research Co.
WacLine, Inc.
Western Gear
Weston Electcl. Instr.
Wilson & Co.

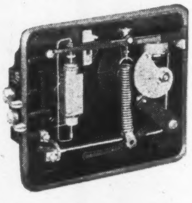
VALVE-OPERATING DEVICES, Electropneumatic, see Converters, Electric-to-pneumatic

VALVE OPERATING DEVICES, Solenoid

Accessory Prods. Corp.
Adel Div., Gen. Metals
Aeronaut., Robertshaw-Fulton
AiResearch Mfg. Co.
Airmatic Valve
Alco Valve Co.
Allen Co., A. K.
A-P Controls Corp.
Askania Reg. Co.
Assoc. Valve & Engrg.
Atkomatic Valve Co.
Atlas Valve Co.
Atwood & Morrill
Automatic Switch Co.
Automatic Temp. Control
Baldwin-Lima-Hamilton
Barber-Colman Co.
Bellows Co.
Bendix Aviation Corp.
Black, Sivalls & Bryson
Bridgeport Thermostat Div.
Bristol Co.
Carruthers & Fernandez
Clark Cooper Co.
Clark Controller Co.
Conoflow Corp.
Continental Equipt. Co.
Continental Foundry
Control Components Co.
Cook Electric
Davis Reg. Co.
Denison Engineering
DeZurik Shower Co.
Distillation Products
Eastern Aircraft Prods.
Eclipse Fuel Engrg. Co.
Emmett Machine
Erickson Specialty
Exact Weight Scale Co.
Fischer & Porter Co.
Frick Co.
Friez Instument Div.
General Controls Co.
GE Apparatus Sales
Gleason-Avery, Inc.
Gordon Co., Claud S.
Gould Co., J. D.
Grove Regulator & Valve
Guardian Elect. Mfg.
Hannifin Mfg. Co.
Hays Corp.
Hays Mfg. Co.
Henry Valve Co.
Hetherington & Berner
Hills-McCanna
Hunt & Son
Hydraulic Controls
Hydromatics, Inc.
Instrument Dev. Labs.
Intercontinental Dynamics
International Instrument
Jackes-Evans Mfg.
Johnson Corp.
Johnson Service
Keckley Co., O. C.
Kieley & Mueller
Kohler Co.
Ledeen Mfg. Co.
Leslie Co.
Magnatrol Valve Corp.
Magnetic Industries
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
McDonnell & Miller, Inc.
McRae Corp.
Midwestern Instrument
Milwaukee Gas
Minneapolis-Honeywell
Moog Valve
Natl. Aircraft Corp.
National Pneumatic
Northern Equipt. Co.
P-K Valve Co.
Parker Appliance
Partlow Corp.
Pegasus Labs.
Penfield Mfg. Co.
Perfex Corp.
Preferred Utilities
Revere Corp.
R.K.L. Valve
Rockwell Co., W. S.
Ross Operating Valve
R-S Prod. Corp.
Sarco Co., Inc.
Schade Valve Mfg. Co.
Schrader's Son, A.
Schutte & Koerting
Schwien Engrg.
Security Valve Corp.
Seely Inst. Co., Inc.
Shallcross Controls
Sinclair-Collins Valve
Smith Co., S. Morgan
Soreng Products
Sparton Cont. Systems
Spence Engrg. Co.
Square D Co.
Squires Co., C. E.
Sterling Engrg. Co.
Sunstrand Machine Tool
Superdraulic Corp.
Synchro-Start Prods.
Taylor Instr. Cos.
Topp Industries, Inc.
Trerice Co.
Vacuum Elec. Engr.
Vacuum Research Co.
Valvair Corp.
Vickers, Inc.
Waterman Engrg. Co.
Westinghouse Air Brake Co.
Weston Electcl. Instr.
White-Rodgers Elect. Co.
Yellow Springs Instrument

VALVE OPERATING DEVICES, Hydraulic, Including Cylinder

Accessory Prods. Corp.
Acme Industrial



BAILEY
POSITIONING RELAY

- Accurately positions a control valve or drive to the control requirements as received pneumatically from the control station. Also included is a cam adjustment for tuning valve or drive characteristics to system characteristics. This unit is ideally suited for control of flow characteristics of regulating devices.

Standard SAMA signal ranges of 3-15 psig or 3-27 psig.

Relay is direct or reverse acting and suitable for top or bottom connected valves. Six pre-shaped cams are supplied for square root, linear, square, and half-travel regulating characteristics.

Request Product Specification P99-5.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For more information circle 410 on inquiry card.

Adel Div., Gen. Metals
Aero-Coupling Corp.
Aeronaut., Robertshaw-
  Fulton
Aeroquip Corp.
Air Associates
AiResearch Mfg.
Airmatic Valve, Inc.
Allen Co., A. K.
American Instrument
Annin Co.
Area Regulators Inc.
Askania Regulator Co.
Assoc. Valve & Engrg.
Atlas Valve Co.
Atwood & Morrill
Autoclave Engrs.
Automatic Switch
Autom. Temp. Control
B-I-F Industries
Bailey Meter
Baldwin-Lima-Hamilton
Barber Colman Co.
Barksdale Valves
Bellows Co.
Bendix, Eclipse-Pioneer
Black, Sivalls & Bryson
Bridgeport Thermostat Div.
Bristol Co.
Builders-Providence
Cameron Iron Works
Carruthers & Fernandez
Cash Co., A. W.
Clark Cooper Co.
Conoflow Corp.
Continental Equip Co.
Controls, Inc.
Denison Engineering
DeZurik Shower Co.
Douglas Automatic
Eastern Aircraft Prod.
Eclipse Fuel Engr.
Emmett Mach. & Mfg. Inc.
Exact Weight Scale Co.
Farris Engineering
Farris Pickering Governor
Farris Valve Corp.
Fischer & Porter Co.
Fisher Governor
Flexible Valve Corp.
Ford Instrument
Foster Engrg. Co.
Fulton Sylphon Div.
General Controls Co.
GE
Gen. Regulator Corp.
Grinnell Co., Inc.
Guardian Elect. Mfg.
Hagan Corp.
Hammel-Dahl Co.
Hanna Engrg. Works
Hasko Valve & Machine
Hays Corp.
Hills-McCanna
Hunt & Son
Hydraulic Controls, Inc.
Hydromatics Inc.
Jamesbury Corporation
Jenkins Bros.
Johnson Service Co.
Keckley Co., O. C.
Kieley & Mueller
Kohler Co.
Lear, Inc.
Ledeen Mfg. Co.
Leslie Co.
Leupold & Stevens
Manning, Maxwll & Moore
Mason-Neilan Regulator
McAlear Mfg. Div.
McRae Corp.
Midwestern Instruments
Minneapolis-Honeywell
Natl. Aircraft Corp.
Natural Gas Equipment
Paul Valve Co.
Penfield Mfg. Co.
Perfex Div.
Philadelphia Gear Works
Phen-Trol Devices
Powers Regulator Co.
Pressure Products
Republic Flow Meters
Republic Mfg. Co.
Rivett Lathe & Grinder
R.K.L. Valve & Mfg. Co.
R-S Prod. Corp.
Rockwell Co., W.S.
Rockwell Mfg.
Schade Valve Mfg. Co.
Schutte & Koerting
Seely Inst. Co.
Shallcross Controls
Shand & Jurs Co.
Sinclair-Collins Valve
Smith Co., S. Morgan
Spence Engineering
Standard Controls, Inc.
Sterling Eng. Co.
Superdraulic Corp.
Swason Engrg.
Topp Industries, Inc.
Vacuum Research Co.
Valvair Corp.
Vectron, Inc.
Versa Prdoucts
Vickers, Inc.
Waterman Engrg. Co.
Weighing Components, Inc.

VALVE OPERATING DEVICES, Pneumatic, including Cylinder

Accessory Prods. Corp.
Adel Precision Products
Aeronaut Div.,
  Robertshaw-Fulton
Air Associates
AiResearch Mfg. Co.
Airmatic Valve, Inc.
Allen Co., A. K.
American Meter Co.
Annin Co.
Area Regulators, Inc.
Askania Reg. Co.
Assoc. Valve & Engrg.
Atlas Valve Co.
Atwood & Morrill
Automatic Switch Co.
Autom. Temp. Control Co.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Barber-Colman Co.
Bastian-Blessing Co.
Bellows Co.
Bendix, Eclipse-Pioneer
Black, Sivalls & Bryson
Boylston Co.
Bristol Co.
Cash Co., D. W.
Cash Valve Mfg. Corp.
Century Controls Corp.
Century Instrument Co.
Clark Cooper Co.
Climax Div.
Conant Bros. Co.
Conoflow Corp.
Continental Equipt. Co.
Cook Electric
Dahl. Co., Inc., G. W.
Davis Reg. Co.
DeZurik Shower Co.
Eclipse Fuel Engrg.
Edward Valves, Inc.
Emmett Machine
Farris Engineering
Farris Flexible Valve
Fischer & Porter Co.
Fisher Governor Co.
Flexible Valve Corp.
Foster Engrg. Co.
Friez Instrument Div.
Foxboro Co.
Fulton Sylphon Div.
General Controls Co.
Genl. Regulators Corp.
Gleason-Avery Inc.
Gotham Instr. Div.
Grinnell Co., Inc.
Hagan Corp.
Hammel-Dahl Co.
Hanna Engrg. Works
Hasko Valve & Machine
Hathaway Instrument
Henry Valve Co.
Hills-McCanna
Hoke, Inc.
Hunt & Son
Hydromatics Inc.
Imperial Brass Mfg.
Industrial Filter
Infilco Inc.
Jackes-Evans
Jamesbury Corp.
Johnson Services Co.
Jordan Regulator
Keckley Co., O. C.
Kieley & Mueller
Klipfel Valves
Kohler Co.
Laboratory Equipment
Larson Instrument
Ledeen Mfg. Co.
Leslie Co.
Manning, Maxwell & Moore
Mason-Neilan Div.
McAlear Mfg.
Mead Specialties Co.
Milwaukee Gas
Minneapolis-Honeywell
  Indust., Div.
Moore Products
Natl. Aircraft Corp.
National Pneumatic
North Amer. Mfg. Co.
Partlow Corp.
Paul Valve Co.
Penfield Mfg. Co.
Perfex Corp.
Philadelphia Gear Works
Powers Regulator Co.
Pressure Products
Refrigerating Spec. Co.
Reliance Instr. Mfg. Co.
Republic Flow Meters
Research Controls
Reynolds Gas Regulator
Rivett Lathe & Grinder
R.K.L. Valve & Mfg. Co.
R-S Products Corp.
Rockwell Co., W. S.
Rockwell Mfg.
Rockwood Sprinkler
Ross Operating Valve Co.
Schade Valve Mfg. Co.
Schrader's Son, A.
Schutte & Koerting
Scientific Instr. Co.
Security Valve Corp.
Seely Inst. Co., Inc.
Shallcross Controls
Sinclair Collins Valve
Smith Co., S. Morgan
Soreng Products
Spence Engrg. Co.
Stratos Div.
Swanson Engrg.
Swartwout Co.
Taylor Instr. Cos.
Trerice Co.
Uniflow Valve Corp.
Valv-Trol Co.
Valvair Corp.
Watts Regulator
Westinghouse Air Brake Co.
Weston Electcl. Instr.
White Indust. Div., S. S.
White-Rodgers Electric

VALVE POSITIONERS

AiResearch Mfg. Co.
Annin Co.
Askania Reg. Co.
Atlas Valve Co.
Automatic Temp. Control
B-I-F Industries
Bailey Meter Co.
Bristol Co.
Builders-Providence
Cleveland Fuel Equip.
Conoflow Corp.
Crescent Engrg. & Res. Co.
Dahl Co., Inc., G. W.
DeZurik Shower Co.
Farris Flexible Valve
Fischer & Porter Co.
Fisher Governor Co.
Foxboro Co.
General Controls Co.
General Regulator
Hagan Corp.
Hammel-Dahl
Hays Corp.
Johnson Service Co.
Ledeen Mfg. Co.
Magnetic Industries
Manning, Maxwell & Moore
Mason-Neilan Div.
Minneapolis-Honeywell
  Indust. Div.
Moore Products Co.
National Controls
Penn Insts. Div.
Philadelphia Gear Works
Powers Regulator Co.
Republic Flow Meters
Scientific Instr. Co.
Shallcross Controls
Stratos Div.
Superdraulic Corp.
Swartwout Co.
Taylor Instr. Cos.
Techniflex Corp.
Tejax Engrg. Corp.
Weighing Components
Weston Electl Instr.
Westinghouse Air Brake Co.

VALVE POSITION REMOTE INDICATORS

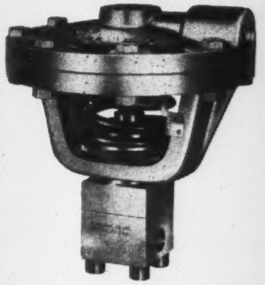
Aeronaut., Robertshaw-
  Fulton
Airmatic Valve
Allis-Chalmers
Annin Co.
Atlas Valve Co.
Autocall Co.
Automatic Control Co.
Automatic Temp. Control
B-I-F Industries
Bailey Meter Co.
Barber Coleman
Beck Co.
Black, Sivalls & Bryson
Bristol Co.
Builders-Providence
Climax Div.
Colvin Labs., Inc.
Conoflow Corp.
Crescent Engrg. & Res. Co.
Cutler-Hammer, Inc.
DeZurick Shower Co.
Doelcam Div.
Elec. Indicator Corp.
Elec. Tachometer Corp.
Fisher Governor Co.
Foxboro Co.
General Controls
G.E., Apparatus Sales
Gen. Regulator Corp.
Hammel-Dahl Co.
Kieley & Mueller
Kybernetes Corp.
Lear, Inc.
Leupold & Stevens
Magnetic Industries
Mason-Neilan Div.
Minneapolis-Honeywell
  Indust. Div.
Moore Products
North American Insts.
Northern Equipment Co.
Panellit, Inc.
Philadelphia Gear Works
Republic Flow Meters
SCAM Instrument
Shand & Jurs Co.
Sparton Cont. Systems
Superdraulic Corp.
Taylor Instr. Cos.
Tejax Eng. Corp.
Uniflow Valve
Weighing Components
Westinghouse Electric
Weston Electcl. Instr.
Wheelco Instr. Co.

VALVES, Automatic Shutoff, including Fuel Shutoff

Accessory Prods. Corp.
Aeronaut, Robertshaw-
  Fulton
AiResearch Mfg. Co.
Airmatic Valve
American Meter Co.
Annin Co.
A-P Controls Corp.
Askania Reg. Co.
Assoc. Valve & Engr. Co.
Atlas Valve Co.
Atwood & Morrill
Autom.Switch Co.
Autom. Temp. Control
Autom. Valve Controller
Automation Prods., Inc.
Barber-Colman Co.
Barksdale Valves
Bastian-Blessing
Black, Sivalls & Bryson
Bristol Co.
Carruthers & Fernandez
Cash Co., A. W.
Cash Valve Mfg. Corp.
Clark Cooper Co.
Climax Div.
Continental Equipt. Co.
Cutler-Hammer
Dahl Co., G. W.
Davis Reg. Co.
DeZurik Shower Co.
Douglass Automatic
Eastern Aircraft Prods.
Eclipse Fuel Engrg. Co.
Edison Co., Thomas A.
Edward Valves, Inc.
Electronics Corp. of Amer.
Exact Weight Scale Co.
Farris Engineering
Farris Flexible
Fisher Governor Co.
Fischer & Porter Co.
Flexible Valve Corp.
Foster Engrg. Co.
Frick Co.
Friez Instrument
Fulton Sylphon Div.
Gar Prec. Parts, Inc.
Gas Appliance Specialties
General Combustion Corp.
General Controls Co.
Golden Anderson
Gould Co., J. D.

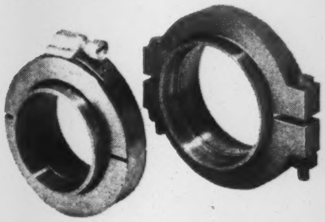
MINIATURIZATION

From Pilot Plant to Process



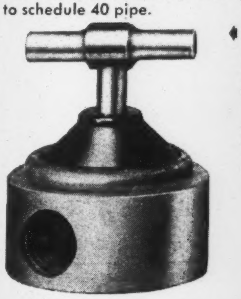
◆ **"BANTAM" 500 SERIES**

Throttling "Bantam" Diaphragm Control Valves for all standard control valve uses, Cv of 0.6 and below, up to 1000 psi and 500°F, characterized, renewable trim, 316 stainless steel and teflon only wetted surfaces, low in hysteresis, size and weight, a modern design of control valve. 2000 series "Bantam" Control Valves available for on-off service.



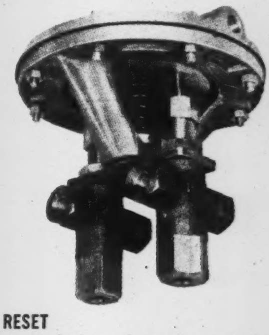
TUBE AND PIPE CONNECTORS ◆

For use in such systems as aircraft or marine applications where weight is a factor, these connectors replace standard flanges. Available in various materials, in male or female socket or butt weld design, for tubing, and up to schedule 40 pipe.



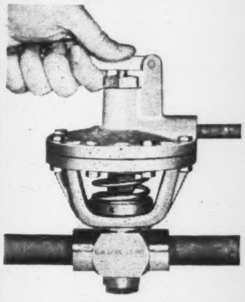
◆ **"DEMI" PACKLESS VALVES**

For services when packing is a problem, manifolding of small valves in one unit, these low cost valves have a great popularity. For services up to 1500 psi and 500°F., screw, toggle, or diaphragm operated, the "Demi" line is ideal for panel mounting up to five valves in one block.



WHIFFLETREE OPERATOR ◆

Two valves operated simultaneously by one operator. Valves may be globe or three-way and have a multitude of piping arrangements for mixing and routing applications.



◆ **MANUAL RESET**

Wherever control air on dangerous or toxic process flows must be blocked for safety, on air failure until manually reset, these valves insure against disaster. Standard sizes ¼" and ½" I.P.S.

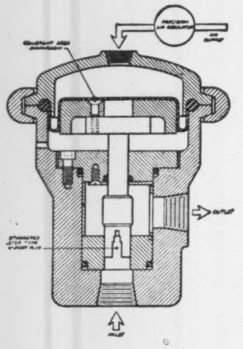
SAUNDERS VALVES — AIR OPERATED ◆

Plastic valves, 2" and below, metal valves 1" and below, G. W. Dahl Company, Inc. diaphragm operators on these valves provide simple, sure automatic operation. Each application must submit full flow information.

Write us for complete technical information, or the address of our representative in your area.

George W. DAHL Company
BRISTOL, RHODE ISLAND

For more information circle **411** on inquiry card.



COMPLETE BACK PRESSURE CONTROL SYSTEM

This sectional drawing shows the design and construction of our novel Micro Delta P Controllers. When used with a regulated air supply, they provide a complete back pressure control system. A Micro Delta P Controller maintains a constant pressure on the discharge side of a non-pulsing hydraulic system by throttling the flow from the hydraulic power source at any flow rates within its range.

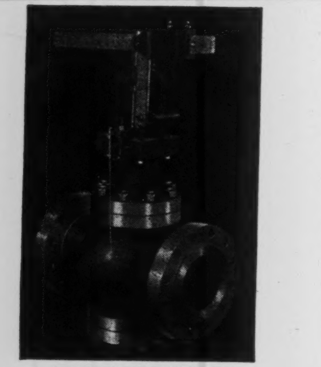
A significant feature of the Controller is the constant area, rolling type diaphragm. Use of it results in linearity between the loading pressure and the controlled back pressure. This construction, as opposed to piston type actuator, also provides greater sensitivity and repeatability with minimum hysteresis.

Micro Delta P Controllers have been used for many purposes such as the maintaining of a constant upstream pressure from the discharge of test pumps, and as controllers for hydraulic dynamometers. Two Micro Delta P Controllers used together can provide preset and intricate loading patterns for various types of actuator testing.

Write for our new bulletin, No. 544 which gives complete details and shows suggested schematic flow diagrams.

INDUSTRIAL ENGINEERING CORPORATION
525 E. Woodbine, Louisville 8, Ky.

For more information circle 412 on inquiry card.



REPUBLIC REGULATING VALVES

All Republic valves are engineered to the specific job on which they are used. Cylinder operated valves are available in sizes from 3 in. to 24 in. Hand operated valves in sizes from 1 in. to 8 in. Lever operated valves in sizes up to 16 inch.

Republic valves are built in all pressure standards — both flanged and welded ends. Streamlined flow through parts virtually eliminates erosion.

WRITE FOR DATA BOOK No. S-40

REPUBLIC FLOW METERS CO.
2240 Diversey Pkwy. Chicago 47, Ill.

REPUBLIC
INSTRUMENTS • CONTROLS

For more information circle 413 on inquiry card.

Grove Regulator
Hammel-Dahl Co.
Hasko Valve & Machine
Henry Valve Co.
Hetherington & Berner
Hills-McCanna
Hydromatics Inc.
Imperial Brass
Jackes-Evans Mfg.
James-Pond-Clark
Jerguson Gage
Johnson Service
Jordan Regulator Corp.
Kahn & Co.
Keckley Co., O. C.
Kieley & Mueller
Klipfel Valves
Leslie Co.
Lonergan Co.
Magnatrol Valve
Magnetic Industries
Mason-Neilan Div.
McAlear Mfg.
Metal Goods Corp.
Milwaukee Gas Spec.
Minneapolis-Honeywell
Natl. Aircraft Corp.
National Controls
Natural Gas Equipt.
North Amer. Mfg. Co.
OPW Corp.
P-K Valve Co.
Partlow Corp.
Penn Electric Switch
Pennsylvania Pump
Petrometer Corp.
Power Engrg. & Equipt.
Preferred Utilities
Republic Mfg. Co.
Research Controls
Revere Corp.
Reynolds Gas Reg. Co.
R. K. L. Valve & Mfg. Co.
Robbins Aviation
Rockwell Co., W. S.
Rockwell Mfg. Co.
Ross Operating Valve
R-S Prod. Corp.
Schade Valve Mfg. Co.
Schrader's Son, A.
Schutte & Koerting
Security Valve Corp.
Seely Inst. Co., Inc.
Selas Corp. of Amer.
Shand & Jurs Co.
Sinclair-Collins Valve
Skinner Elect. Valve Div.
Smith Co., S. Morgan
Snap-Tite, Inc.
Spence Engineering Co.
Sprague Engrg. Corp.
Squires Co., C. E.
Straham Valves
Uniflow Valve
Vacuum Research Co.
Valco, Inc.
Valvair Corp.
Valv-Trol Co.
Vapor Recovery Systems
Viking Instr. Co.
Watts Regulator Co.
Weatherhead Co.
Wheelco Instr. Co.
W-K-M Mfg. Co.
Zenith Optical

VALVES, Bellows Seal, see Valves, Packless

VALVES, Butterfly

Accessory Prods. Corp.
Aeronaut., Robertshaw-Fulton
AiResearch Mfg. Co.
Atwood & Morrill
B-I-F Industries
Baldwin-Lima-Hamilton
Black, Sivalls & Bryson
Century Controls Corp.
Conoflow Corp.
Continental Equipment
Dahl Co., G. W.
Eclipse Fuel Engrg. Co.
Fisher Governor Co.
Foxboro Co.
General Controls Co
Hagan Corp.
Hammel-Dahl Co.
Hasco Valve & Machine
Johnson Service Co.
Mason-Neilan Div.
Minneapolis-Honeywell Indust. Div.
Natl. Aircraft Corp.
National Controls
Republic Flow Meters
Rockwell Co., W. S.
Schutte Koerting
Smith Co., S. Morgan
Stratos Div.
Worthington Corp.

VALVES, Constant Pressure

A-P Controls Corp.
Accessory Prods. Corp.
Air Associates
AiResearch Mfg. Co.
Airmatic Valve
Alco Valve
Annin Co.
Askania Reg. Co.
Assoc. Valve & Engrg.
Atlas Valve
Atwood & Morrill
Autom. Switch Co.
Bailey Meter Co.
Bastian-Blessing
Black, Sivalls & Bryson
Brooke Engrg. Co.
Cash Co., A. W.
Cash Valve Mfg. Corp.
Climax Div.
Conoflow Corp.
Continental Equip. Co.
Cooper Co., Clark
Cutler Hammer
Davis Reg. Co.
Dennison Engineering
Eastern Aircraft Prods.
Eclipse Fuel Engrg. Co.
Fisher Governor Co.
Foster Engrg. Co.
Fulton-Sylphon Div.
Gadgets, Inc.
General Controls
Golden-Anderson
General Regulators
Grove Valve & Regulator
Hammel-Dahl Co.
Henry Valve Co.
Hoke, Inc.
Indust. Engrg. Corp.
Jenkins Bros.
Jordan Regulator Corp.
Kates Co., W. A.
Keckley Co., O. C.
Kieley & Mueller
Klipfel Valves
Leslie Co.
McAlear Mfg. Co.
Mercon Regulator
Minneapolis-Honeywell
Moog Valve
Natl. Aircraft Corp.
Natural Gas Equipment
Newmatic Corp.
Powers Regulator Co.
Reynolds Gas Reg. Co.
R.K.L. Valve & Mfg. Co.
R-S Prods. Corp.
Rockwell Co, W. S.
Robbins & Assocs.
Schade Valve Mfg. Co.
Schutte & Koerting
Seely Inst. Co.
Sinclair-Collins Valve
Smith Co., S. Morgan
Spence Engrg. Co.
Squires Co., C. E.
Stratos Div.
Superdraulic Corp.
Swartwout Co.
Taylor Instr. Cos.
Uniflow Valve
Vickers, Inc.
Wallace & Tiernan
Watts Regulator Co.
Weston Electcl. Instr.

VALVES, Control, Electrically-operated

Aeronaut, Robertshaw-Fulton
AiResearch Mfg. Co.
Airmatic Valve, Inc.
Alco Valve Co.
Allen Co., A. K.
American Valve Co.
Annin Co.
A-P Controls Corp
Assoc. Valve & Engrg.
Atkomatic Valve Co.
Atlas Valve Co.
Atwood & Morrill
Autoclave Eng'rs.
Autom. Controls Corp.
Autom. Switch Co.
Autom. Temp. Control
Automation Prod., Inc.
B-I-F Industries
Baldwin-Lima-Hamilton
Barber-Colman Co.
Barksdale Valves
Beck Co.
Bellows Co.
Bendix Aviation Corp.
Black, Sivalls & Bryson
Bridgeport Thermostat Div.
Bristol Co.
Brooke Engrg. Co.
Builders-Providence
Carruthers & Fernandez
Cash Co., A. W.
Clark Controller Co.
Clark Cooper Co.
Conoflow Corp.
Continental Equipt. Co.
Cutler-Hammer, Inc.
Dahl Co., G. W.
Davis Reg. Co.
Denison Engineering
DeZurik Shower Co.
Distillation Products
Eclipse Fuel Engrg. Co.
Edward Valves, Inc.
Electric Valve Mfg.
Fischer & Porter Co.
Flexible Valve Corp.
Foster Engrg. Co.
Foxboro Co.
Frick Co.
Friez Instrument
Fulton Sylphon Div.
Gar Prec. Parts, Inc.
General Controls Co.
GE Co.
Gen. Regulator Corp
Golden-Anderson
Gould Co., J. D.
Grinnell Co., Inc.
Guardian Elec. Mfg.
Hanna Engrg. Works
Hasko Valve & Machine
Hays Mfg. Co.
Henry Valve Co.
Hills-McCanna
Humphrey Prod.
Hunt & Son
Hydraulic Controls Co.
Hydromatics Inc.
Ideal-Aerosmith
Infilco Inc.
Internat. Instr. Co.
Jenkins Bros.
Johnson Service
Kieley & Mueller
Klipfel Valves
Lear, Inc.
Ledeen Mfg. Co.
Lumenite Electronic
Magnatrol Valve Corp.
Magnetic Industries
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Modernair Corp.
Mason-Neilan Div
Midwestern Instruments
Minneapolis-Honeywell Indust. Div.
Moog Valve Co.
Natl. Aircraft Corp.
National Controls
Nicholson & Co., W. H.
Northern Equipment Co.
P-K Valve Co.
Pegasus Labs.
Penn Electric Switch
Perfex Corp.
Philadelphia Gear Works
Preferred Utilities
Pressure Prod. Industries
R.K.L. Valve
R-P&C Valve Div.
R-S Prod. Corp.
Reliance Instr. Mfg. Corp.
Revere Corp.
Rivett Lathe & Grinder
Rockwell Co, W.S.
Rockwell M'g Co.
Ross Operating Valve Co.
Sarco Co., Inc.
Schade Valve Mfg. Co.
Schrader's Son, A.
Schutte & Koerting Co.
Security Valve Corp.
Sinclair-Collins Valve
Skinner Elec. Valve Div.
Smith Co., S. Morgan
Spence Engrg. Co.
Square D. Co.
Squires Co., C. E.
Standard Controls, Inc.
Supreme Elec. Prods.
Topp Industries, Inc.
Vacuum Elec. Engr.
Vacuum Research Co.
Valvair Corp.
Versa Prod. Co.
Vickers, Inc.
W-K-M Mfg. Co.
Warren Engrg. Co.
Waterman Engrg. Co.
Wedgeplug Valve
Weighing Components
Weston Electd. Instr.
White-Rodgers Elec. Co.
Yellow Springs Inst. Co.

VALVES, Control, Hydraulically-operated

Accessory Prods. Corp.
Acme Industrial
Aero-Coupling Corp.
Aeronaut, Robertshaw-Fulton
Aeroquip Corp.
Air Associates
AiResearch Mfg.
Airmatic Valve, Inc.
Amer. Instr. Co.
Annin Co.
Area Regulators Inc.
Askania Regulator Co.
Assoc. Valve & Engrg.
Atlas Valve Co.
Atwood & Morrill
Auto Control Labs.
Autoclave Engrs.
Automatic Switch
Auto. Temp. Control
B-I-F Industries
Bailey Meter
Baldwin-Lima-Hamilton
Barber Colman Co.
Barksdale Valves
Bellows Co.
Bendix, Eclipse-Pioneer
Black- Sivalls & Bryson
Bridgeport Thermostat Div.
Bristol Co.
Builders-Providence
Cameron Iron Works
Carruthers & Fernandez
Cash Co., A.W.
Cash Valve Mfg. Corp.
Clark Cooper Co.
Conoflow Corp.
Continental Equipt. Co.
Controls, Inc.
Dahl Co., G.W.
Denison Engineering
DeZurik Shower Co.
Douglass Automatic
Eclipse Fuel Engr.
Exact Weight Scale Co.
Farris Engineering
Farris Pickering Governor
Farris Valve Corp.
Fisher Governor Co.
Flexible Valve Corp.
Ford Instrument
Foster Engrg. Co.
Fulton Sylphon Div.
General Controls
Gen. Regulator Corp.
Golden Anderson
Grinnell Co., Inc.
Guardian Elect. Mfg.
Hagan Corp.
Hammel-Dahl Co.
Hanna Engrg. Works
Hasko Valve & Machine
Hays Corp.
Hills-McCanna
Hunt & Son
Hydraulic Controls, Inc.
Hydromatics Inc.
Infilco Inc.
Jamesbury Corporation
Jenkins Bros.
Johnson Service Co.
Jordon Regulator
Keckley Co., O.C.
Kieley & Mueller
Kohler Co.
Lear, Inc.
Ledeen Mfg. Co.
Leslie Co.
Leupold & Stevens
Manning, Maxwell & Moore
Mason-Neilan Div.
McAlear Mfg. Div.
McRae Corp.
Midwestern Instruments
Minneapolis-Honeywell
Nat'l. Aircraft Corp.
Natural Gas Equipment
P-K Valve Co.
Parks-Cramer Co.
Parsons Co., Ralph M.
Perfex Div.
Philadelphia Gear Works
Phen-Trol Devices
Powers Regulator Co.
Pressure Prods. Industries
R.K.L. Valve & Mfg. Co.
R-S Prod. Corp.
Republic Flow Meters
Republic Mfg. Co.
Rivett Lathe & Grinder
Rockwell Co., W.S.
Rockwell Mfg. Co.
Ross Operating Valve Co.
Schade Valve Mfg. Co.
Schutte & Koerting Co.
Seely Instr. Co.
Shallcross Controls
Shand & Jurs Co.
Sinclair-Collins Valve
Skinner Elec. Valve Div.
Smith Co., S. Morgan
Spence Engineering
Squires Co., C.E.
Standard Controls, Inc.
Sterling Engrg. Co.
Sundstrand Machine Tool
Superdraulic Corp.
Topp Industries, Inc.
Uniflow Valve Corp.
Vacuum Research Co.
Valvair Corp.
Vectron, Inc.
Versa Prod. Co.
Vickers, Inc.
Wallace Tiernan
Warren Engrg. Co.
Waterman Engrg. Co.
Weighing Components

VALVES, Control, Pneumatically-operated

Accessory Prods. Corp.
Aeronaut, Robertshaw-Fulton
Airmatic Valve
Allen Co., A.K.
American Meter Co.
Annin Co.
Ashton Valve Co.
Assoc. Valve & Engrg.
Atlas Valve Co.
Atwood & Morrill
Autom. Switch Co.
Automation Prods., Inc.
B-I-F Industries
Barksdale Valves
Bellows Co.
Black-Sivalls & Bryson
Bristol Co.
Cameron Iron Works
Carruthers & Fernandez
Cash Co., A. W.
Cash Valve Mfg. Corp.
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Clark Cooper Co.
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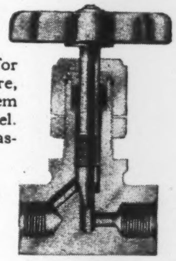
10,000 psi WORKING PRESSURE FORGED BODY

One-piece, stainless steel, forged body and stem guide, with no brazing or welding—*can't* leak or come apart. Has many uses in water, gas, oil, and vacuum service.



Proofed at 25,000 psi for 10,000 psi working pressure, to 200° F. Semi-needle stem of *hardened* stainless steel. Available with graphited asbestos or Teflon packing.

Easy grip handle. Panel mounting. Female pipe connections, sizes ⅛" up to ½".

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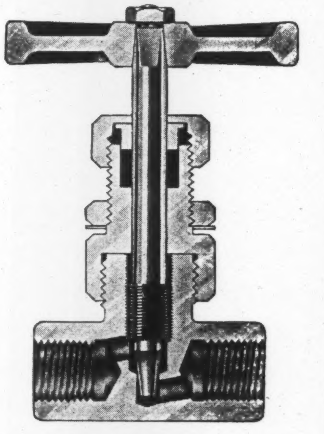

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Foxboro Co.
Fulton Sylphon Div.
Gar Prec. Parts, Inc.
General Controls Co.
Genl. Regulator Corp.
Golden-Anderson
Grinnell Co.
Hanna Engrg. Works
High Vacuum Equipt. Corp.
Hills-McCanna
Humphrey Prod.
Hydromatics Inc.
Indust. Engrg. Corp.
Infilco Inc.
Jamesburg Corp.
Johnson Service Co.
Jordan Regulator Corp.
Keckley Co., O. C.
Kieley & Mueller
Klipfel Valves
Ledeen Mfg. Co.
Leslie Co.
Mason-Neilan Div.
McAlear Mfg. Co.
Mead Specialties Co.
Minneapolis-Honeywell
  Indust. Div.
Modernair Corp.
Natl. Aircraft Corp.
National Pneumatic Co.
Natural Gas Equipt.
Norgren Co., C. A.
Parks-Cramer Co.
Powers Regulator Co.
Pressure Prod. Industries
R. K. L. Valve & Mfg. Co.
Republic Flow Meters
Research Controls
Rivett Lathe & Grinder
Rockwell Co., W. S.
Rockwell Mfg. Co.
Ross Operating Valve Co.
Schrader's Son, A.
Schutte & Koerting
Seely Instr. Co.
Skinner Elec. Valve Div.
Smith Co., S. Morgan
Spence Engrg. Co.
Squires Co., C. E.
Stratos Div.
Taylor Instr. Cos.
Uniflow Valve Corp.
Versa Prods Co.
Wallace & Tiernan
Warren Engrg. Co.
Westinghouse Air Brake Co.

VALVES, Diaphragm Seal, including Saunders Patent, Crane, Wynn Type, etc.

Autom. Switch Co.
Black, Sivalls & Bryson
Conoflow Corp.
Dahl Co., G. W.
Foxboro Co.
General Controls Co.
Grinnell Co.
Hills-McCanna Co.
Mason-Neilan Div.
Simmonds Aerocessories
Stockdale Engrg. Co.
Uniflow Valve Corp.

VALVES, Flexible Sleeve

Autom. Switch Co.
Farris Engrg. Corp.
Internat. Instr. Co.
R.K.L. Valve & Mfg. Co.
Research Controls
Rockwell Co., W.S.

VALVES, Float-operated

Accessory Prods. Corp.
Anderson Co., V.D.
Assoc. Valve & Engrg.
Atlas Valve Co.
Atwood & Morrill
Black, Sivalls & Bryson
Clark Cooper Co.
Foster Engrg. Co.
Frick Company
Fulton Sylphon Div.
Golden-Anderson
Jordan Regulator Co.
Keckley Co., O. C.
Kieley & Mueller, Inc.
Klipfel Valves
Phillips & Co., H. A.
McAlear Mfg. Co.
McDonnel & Miller, Inc.
Phillips & Co., H. A.
R.K.L. Valve & Mfg. Co.
Revere Corp. of Amer.
Rockwell Co., W.S.
Schade Valve Mfg.Co.
Smith Co., S. Morgan
Spence Engrg. Co.
Vanton Pump & Equipt.
Watts Regulator Co.

VALVES, Gage Cocks

Accessory Prods. Corp.
Assoc. Valve & Engrg.
Crosby Steam Gage & Valve
Grove Valve & Reg. Co.
Jerguson Gage
Keckley Co., O. C.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Metal Goods Corp.
Reliance Gauge Column
U. S. Gauge Div.
Weatherhead

VALVES, High Pressure

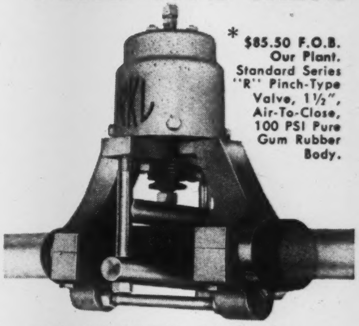
Accessory Prods. Corp.
Air Associates
Amer. Instr. Co.
Annin Co.
Assoc. Valve & Engrg.
Atkomatic Valve Co
Atlas Valve Co.
Atwood & Morrill
Autoclave Engrs.
Autom. Switch Co.
Autom. Temp. Control Co.
Automation Prod., Inc.
Bailey Meter Co.
Barksdale Valves
Bastian-Blessing
Black, Sivalls & Bryson
Bridgeport Thermostat
Carruthers & Fernandez
Cash Co., A. W.
Cash Valve Mfg. Co.
Clark Cooper Co.
Conoflow Corp.
Crosby Steam Gage
Dahl Co., G. W.
Dragon Engrg. Co.
Eastern Aircraft Prod.
Edward Valves, Inc.
Farris Engrg. Corp.
Fisher Governor Co.
Foster Engrg. Co.
Foxboro Co.
Frick Company
Fulton Sylphon Div.
Gar Prec. Parts, Inc.
General Controls Co.
Gould Co., J. D.
High Pressure Equipt. Co.
Hoke, Inc.
Hydromatics Inc.
Leslie Co.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Metal Goods Corp.
Minneapolis-Honeywell
  Indust. Div.
Natl. Aircraft Corp.
National Controls
Pressure Prod. Industries
R-P & C Valve Div.
Republic Flow Meters
Republic Mfg. Co.
Research Controls
Robbins & Assocs.
Robertshaw-Fulton Conts.
Rockwell Co., W. S.
Ruska Instr. Corp.
Schutte & Koerting
Security Valve Corp.
Seely Instr. Co.
Skinner Elec. Valve Div.
Smith Co., S. Morgan
Spence Engrg.Co.
Squires Co., C.E.
Stratos Div.
Superdraulic Corp.
Uniflow Valve Corp.
Waterman Engrg. Co.

VALVES, Lubricated Plug

ACF Industries, Valve Div.
Accessory Prods. Corp.
Acme Industrial
Airmatic Valve
Conant Bros. Co.
Conoflow Corp.
Dragon Engrg. Co.
Eclipse Fuel Engrg. Co.
General Controls
Imperial Brass Mfg. Co.

compare this

PINCH-TYPE VALVE



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ON QUALITY ALONE...

ON COST ALONE*

No matter how you compare an RKL pneumatically - operated pinch valve . . . it always comes out on top. Check these exclusive features and you'll see why.

- **Rolling diaphragm air motor . . . proven in millions of tough applications . . . unmatched for positioning accuracy and linearity.**
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- **Solid cast aluminum alloy frame . . . light weight combined with high mechanical strength.**
- **Pinch limit stops . . . prevent over-pinch regardless of air pressure . . . longer body life . . . no accidental failures.**
- **Completely self-supporting . . . never any need to give an RKL valve extra support.**

SPECIFICATIONS IN BRIEF

PIPE SIZE: All standard pipe sizes, ¼" to 14".

TYPES: Air-to-open, air-to-close, quick-acting hand lever operated, handwheel operated, solenoid operated, hydraulically operated.

CONNECTIONS: Flanged or slide-on.

BODY MATERIAL: Pure gum rubber is standard. Teflon, polyethylene, other rubbers available.

DIMENSIONS AND WEIGHT: 1½" valve illustrated above measures approximately 11½ x 6 x 12 and weighs just less than 14 pounds.

BULLETIN 1154 gives a complete description of RKL pinch valves, applications, body materials, capacities, etc. . . . *a handy reference guide that's yours on request.*

RKL VALVE & MANUFACTURING CO.
ROUTE 38 & RUDDEROW AVE.
MAPLE SHADE, NEW JERSEY

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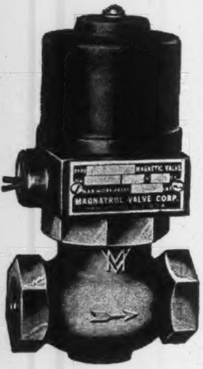
Eliminate

Costly
Flow Failures



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Quick Operating *Non Sticking* *Tight Seating*

These three design advantages are your assurance against costly flow failures. Attain dependable, accurate, automatic or remote control of liquids or gases with Magnatrol Valves. Installed quickly and easily in connection with . . . flow-meters, thermostats, float and time switches. Every Magnatrol Valve is delivered to you—factory tested—guaranteed free from defects in material and workmanship.

Available in normally closed or normally open models. Pressure ranges from zero up to 300 PSI. Voltages to 575.

Catalog containing complete specifications mailed upon request.

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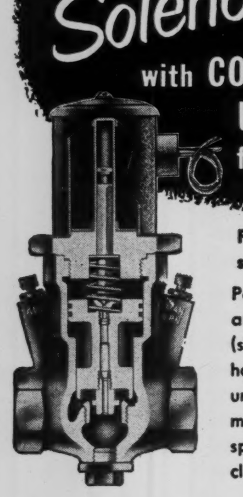
THE ONLY Solenoid Valves with COILS GUARANTEED UNCONDITIONALLY for one year



For automatic or remote control of steam, air, gas or liquid flow

Packless • ¼" to 3" • Full port area • Handle pressures to 1200 psi (steam 150 psi) • Only 1-lb. pressure holds valve open • Coils guaranteed unconditionally for one year • Normally open, explosion proof and other special types • Adjustable cushioned closing and manual opening built in.

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Parks-Cramer Co.
Republic Mfg. Co.
Rockwell Mfg. Co.
Vanton Pump & Equipt.
W-K-M Mfg. Co.

VALVES, Needle

Accessory Prods. Corp.
Allen Co., A. K.
Amer. Instr. Co.
Amer. Meter Co.
Annin Co.
Assoc. Valve & Engrg.
Autoclave Engrs.
Autom. Switch Co.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bastian-Blessing
Clark Cooper Co.
Conoflow Corp.
Dahl Co., G. W.
Dragon Engrg. Co.
Edward Valves, Inc.
Fisher Governor Co.
Foxboro Co.
Fulton Sylphon Div.
Greiner Co., Emil
Grove Valve & Reg. Co.
Henry Valve Co.
High Pressure Equipt. Co.
Hoke, Inc.
Ideal-Aerosmith
Imperial Brass
James-Pond-Clark
Jerguson Gage
Lab. Furniture Co.
Leslie Co.
Manning, Maxwell & Moore
Manostat Corp.
Marsh Corp., Jas. P.
Metal Goods Corp.
Norgren Co., C. A.
Parr Instr. Co.
Pressure Prod. Industries
R-P & C Valve Div.
Republic Mfg. Co.
Research Controls
Reynolds Gas Reg. Co.
Robbins & Assocs.
Ruska Instr. Corp.
Uniflow Valve Corp.
Vickers, Inc.

VALVES, Non-Lubricated Plug

Conant Bros. Co.
Dahl Co., G. W.
Hasco Valve & Machine
Minneapolis-Honeywell
Republic Mfg. Co.
Wedgeplug Valve Co.

VALVES, Packless

Accessory Prods. Corp.
Allen Co., A. K.
Annin Co.
Assoc. Valve & Engrg.
Atkomatic Valve Co.
Atwood & Morrill
Autom. Switch Co.
Barber-Colman Co.
Bastian-Blessing
Conoflow Corp.
Cooper Co., Clark
Dahl Co., G. W.
Foxboro Co.
Fulton Sylphon Div.
Hanna Engrg. Works
Hills-McCanna Co.
Hoke, Inc.
Imperial Brass
Jordan Regulator Co.
Marsh Corp. Jas. P.
Powers Regulator Co.
Pressure Prods. Industries
R.K.L. Valve & Mfg. Co.
Research Controls
Robbins Aviation
Robertshaw-Fulton Conts.
Skinner Elec. Valve Div.
Spence Engrg. Co.
Squires Co., C.E.
Vacuum-Electron Engrg.

VALVES, Pressure Reducing and/or Back-Pressure, see Valves, Control

VALVES, Relief and Safety

Accessory Prods. Corp.
Adel Precision Prods.
Aeronaut., Robertshaw-Fulton
Amer. Instr. Co.
Amer. Meter Co.
Assoc. Valve & Engrg.
Atlas Valve Co.
Atwood & Morrill
Autoclave Engrs.
Autom. Switch Co.
Bastian-Blessing
Carruthers & Fernandez
Cash Valve Mfg. Corp.
Circle Seal Prods.
Clark Cooper Co.
Crosby Steam Gage
Eastern Aircraft Prod.
Edward Valves, Inc.
Farris Engrg. Corp.
Foster Engrg. Co.
Frick Co.
Fulton Sylphon Div.
Gar Prec. Parts, Inc.
Golden-Anderson
Hoke, Inc.
James-Pond-Clark
Jordan Regulator Co.
Keckley Co., O.C.
Klipfel Valves
Lapp Insulator Co.
Lear, Inc.
Leslie Co.
Manning, Maxwell & Moore
Marine & Indust. Prod.
McAlear Mfg. Co.
McDonnell & Miller, Inc.
Metal Goods Corp.
Micromat Co.
Norgren Co., C. A.
Parks-Cramer Co.
Pressure Prod. Industries
R. K. L. Valve Mfg. Co.
Republic Mfg. Co.
Research Controls
Reynolds Gas Reg. Co.
Rivett Lathe & Grinder
Robertshaw-Fulton Conts.
Rockwell Co., W. S.
Schutte & Koerting
Security Valve Corp.
Shand & Jurs Co.
Smith Co., S. Morgan
Squires Co., C. E.
Stratos Div.
Superdraulic Corp.
Vapor Recovery Systems Co.
Viking Insts.
Watts Regulator Co
Westinghouse Air Brake Co.

VALVES, Saunders Patent Type, see Valves, Diaphragm Seal

VALVES, Slurry, see Valves, Flexible Sleeve

VALVES, Solenoid-operated

A-P Controls Corp.
Accessory Prods. Corp.
Adel Precision Prods.
Aeronaut., Robertshaw-Fulton
AiResearch Mfg. Co.
Airmatic Valve, Inc.
Allen Co., A. K.
Assoc. Valve & Engrg.
Atkomatic Valve Co.
Atwood & Morrill
Autom. Controls Corp.
Autom. Switch Co.
Automation Prod., Inc.
Barksdale Valves
Bellows Co.
Bridgeport Thermostat
Carruthers & Fernandez
Century Controls Corp.
Clark Controller Co
Clark Cooper Co.
Eastern Aircraft Prod.
Eclipse Fuel Engrg. Co.
Electronics Corp. of Amer.
Exact Weight Scale Co.
Fischer & Porter Co.
Foster Engrg. Co.
Frick Company
General Controls Co.
Golden-Anderson
Gould Co., J. D.
Grinnell Co.
Guardian Elect. Mfg. Co.
Hanna Engrg. Works
Hays Mfg. Co.
Humphrey Prods.
Hydraulic Controls Co.
Hydromatics Inc.
Keckley Co., O. C.
Leslie Co.
Magnatrol Valve Corp.
Marsh Corp., Jas. P.
McDonnell & Miller, Inc.
Mead Specialties Co.
Minneapolis-Honeywell Indust. Div.
Modernair Corp.
Natl. Aircraft Corp.
National Pneumatic Co.
Nicholson & Co., W. H.
Pressure Prod. Industries
R. K. L. Valve & Mfg. Co.
Rivett Lathe & Grinder
Rockwell Co., W. S.
Ross Operating Valve Co.
Sarco Co.
Schrader's Son, A.
Schutte & Koerting
Security Valve Corp.
Skinner Elec. Valve Div.
Smith Co., S. Morgan
Spence Engrg. Co.
Squires Co., C. E.
Taylor-Winfield Corp.
Trerice Co., H. O.
Vacuum-Electron. Engrg.
Versa Prods. Co.
Wallace & Tiernan
Waterman Engrg. Co.
Westinghouse Air Brake Co.

VALVES, Solenoid-pilot controlled

Adel Precision Prods.
Aeronaut., Robertshaw-Fulton
Airmatic Valve, Inc.
Allen Co., A. K.
Annin Co.
Assoc. Valve & Engrg.
Atkomatic Valve Co.
Atwood & Morrill
Autom. Switch Co.
Automation Prod., Inc.
Barksdale Valves
Bellows Co.
Bridgeport Thermostat
Carruthers & Fernandez
Century Controls Corp.
Clark Controller Co.
Clark Cooper Co.
Dahl Co., G. W.
DeZurick Shower Co.
Eclipse Fuel Engrg. Co.
Fischer & Porter Co.
Foster Engrg. Co.
Foxboro Co.
Frick Company
General Controls Co.
Golden Anderson
Hanna Engrg. Works
Hays Mfg. Co.
Hydraulic Controls Co.
Hydromatics Inc.
Keckley Co., O. C.
Ledeen Mfg. Co.
Leslie Co.
Magnatrol Valve Corp.
Manning, Maxwell & Moore
Marsh Corp., Jas. Pa.
Minneapolis-Honeywell Indust. Div.
Modernair Corp.
Natl. Aircraft Corp.
National Pneumatic Co.
Nicholson & Co., W. H.
Pegasus Labs.
R. K. L. Valve & Mfg. Co.
Rivett Lathe & Grinder
Rockwell Co., W. S.
Ross Operating Valve Co.
Schrader's Son, A.
Schutte & Koerting
Security Valve Corp.
Skinner Elect., Valve Div.
Smith Co., S. Morgan
Spence Engrg. Co.
Squires Co., C. E.
Superdraulic Corp.
Versa Prods. Co.
Westinghouse Air Brake Co.

VALVES, Toggle

Accessory Prods. Corp.
Bastian-Blessing
Dahl Co., G. W.
Hoke, Inc.
Imperial Brass
Manostat Corp.
National Pneumatic Co.
RKL Valve & Mfg.
Ross Operating Valve Co.
Schrader's Son, A.
Schutte & Koerting

VAPOR TRANSMISSION TESTERS

Atmosphere Control
Testing Machines, Inc.
Thwing-Albert Instr. Co.
U. S. Testing Co.

VARISTORS

Bradley Labs
GE
Internat. Resistance Co.
Radio Receptor Co.
Sylvania Elect. Prods.
Victory Engrg. Corp.

VARMETERS see Volt—Ampere Meters, Reactive

VARNISHES, Amber

Bakelite Corp.
Blossom Mfg. Co.
Lawter Chemicals
Maas & Waldstein
Sullivan Varnish Co.

VARNISHES, Insulating

Acme Wire Co.
Bakelite Div.
Biggs Co., Carl H.
Blossom Mfg. Co.
Borden Co.
Continental-Diam. Fibre
Dolph, John C.
DuPont
Durez Plastics & Chem.
Emerson & Cuming
GE
Maas & Waldstein
Martindale Electric
Mitchell Rand Insulating
Sherwin-Williams
Westinghouse Electric

VEHICLE TRAVEL RECORDERS, see Mileage Indicators

VELOCITY INSTRUMENTS, see Speed

VENTURI METERS, see Flowmeters, Inferential

VENTURI TUBES (see also Flowmeters, Venturi)

B-I-F Industries
Bristol Co.
Foxboro Co.
Infilco Inc.
Penn Insts. Div.
Simplex Valve & Meter Co.

VIALS, Level

Bache & Company, Semon
Canadian Rad. & Uran.
Chaolux & Co.
Disston & Sons, Inc.
Ferner Co.
Fish-Schurman
Gaertner Scientific Corp.
Geier & Bluhm, Inc.
Gurley, W. & L. E.
Stanley Tools
Starrett Co., L. S.
Warren-Knight Co.

VIBRATION INSTRUMENTS, Indicators and/or Recorders

ACF Electronics Div.
Advanced Electronics Inc.
Aero Elcetronics
Airborne Instruments Lab.
Allegany Instr. Co.
Allied Engrg. Div.
Askania-Werke A. G.
Atlantic Research
Authorized Mfrs. Service
Bendix Aviation Corp.
Beta Corp.
Bronoptics Co.
Brush Electronics

Calidyne Co.
Carroll Co.
Century Geophysical
Chesapeake Instr. Corp.
Commercial Res. Div.
Consol. Electrodynamics
Control Devices Inc.
Crescent Engrg. & Res. Co.
Davies Labs.
Daytronic Corp.
Diatron Co.
Dice Co., J. W.
Eastern Prec. Resistor
Edin Co., Inc.
Electro-Mech. Res.
Electro Products Labs.
Electronic Engrg. Serv.
Endevco Corp.
Engrg. Research & Dev
Epic Inc.
Erwood, Inc.
Feiler Engrg. & Mfg. Co.
Fielden Instrument
Fluke Mfg. Co.
Franklin Electronics
Furst Electronic
G E, Apparatus Sales
GE, Instrument Dept.
General Radio Co.
Geotechnical Corp.
Gulton Mfg. Co.
Hathaway Instr. Co.
Heiland Div.
Impact-O-Graph Corp.
Impact Register Co.
Indikon Co.
Industrial Electronics
Industrial Res. & Dev.
Insco Company
Internat. Res. & Dev. Corp.
Jarco Services, Inc.
Kahn & Co., Inc.
Kay Electric
Kistler Instr. Co.
Krohn-Hite Instr. Co.
Kybernetes Corp.
Lab-Tronics
Lance Prods
Magnetic Instr. Co.
Massa Labs.
Midwestern Instruments
Miller Insts., William
Offner Electronics Inc.
Optronic Co.
Panoramic Radio Prod.
Phototron Inst. Corp.
Pickard & Burns
Raytheon Mfg. Co.
Scott, Hermon Hosmer
Sheffield Corp.
Southwestern Ind. Elec.
Sperry Gyroscope Co.
Statham Labs.
Technical Instr. Co.
Techno Inst. Co.
Thordarson-Meissner
U. S. Electronics
Vibra Shock Corp.
Victoreen Instr. Co.
WacLine, Inc.
West Coast Electronics
Westberg Mfg. Co.
Western Radiation Lab.
Westinghouse Electric
Walkirt Co.
Wiancko Engineering
Yellow Springs Inst.

VIBRATION ISOLATORS, see Mountings, Shock and Vibration Absorbing

VIBRATION PICKUPS

Amer. Gyro Corp.
Amperite Co.
Askania-Werke A. G.
Atlantic Research
Bendix Aviation, Pacific
Beta Corp.
Boekel & Co.
Bourns Labs.
Brush Electronics
Calidyne Co.
Carrol Co.
Cheasapeake Inst. Corp.
Commercial Res. Div.
Consol. Electrodynamics
Corbett Science Labs.
Crescent Engrg. & Res. Co.
Crystal Research Labs.
Du Mont Lab.,Allen B.
Edcliff Instruments
Electronic Engrg.
Electro Products Labs.
Electro Voice
Endevco Corp.
Engineering Res. & Dev.
Epic, Inc.
Erwood, Inc.
GE Apparatus Sales
GE Instrument Dept.
General Radio Co.
General Scientific Div.
Genisco, Inc.
Georator Corp.
Geotechnical Corp.
Giannini, G. M.
Globe Phone Mfg.
Gulton Mfg. Co.
Haines Designed Prod.
Hamilton Watch
Hathaway Instr. Co.
Heiland Div.
Industrial Electronics
Internat. Res. & Dev.Corp.
Kistler Instr. Co
Lab-Tronics
M B Mfg. Co.
Massa Labs.
Miller Insts., William
Minatron Corp.
North American Instrs.
Optronic Co.
Phillips Petroleum
Schaevitz Engineering
Scientific Enterprises
Scott, Hermon Hosmer
Shure Brothers
Southwestern Ind. Elec.
Sperry Gyroscope Co.
Statham Laboratories
Technical Instr. Co.
Vibra Shock Corp.
WacLine, Inc.
Westinghouse Electric
Wiancko Engrg. Co.

VIBRATION TEST EQUIPMENT, including Shake Tables

Ahrendt Instr. Co.
All Amer. Tool & Mfg.
Amthor Testing Inst. Co.
Asch Equipment Co.
Askania-Werke A. G.
Associated Research
Atlantic Research Corp.
Baldwin-Lima-Hamilton
Beta Corp.
Biddle Co.
Brush Electronics
Calidyne Co.
Carroll Co.
Century Geophysical
Chadwick-Helmuth Co.
Consol. Electrodynamics
Commercial Research
Electro-Mec Lab.
Electro-Products Lab.
Endevco Corp.
Engineering Res. & Dev.
Erwood, Inc.
Ferner Co.
Fielden Instrument
GE, Apparatus Sales
GE, Instrument Dept.
General Radio
Genisco Inc.
Geotechnical Corp.
Hacker & Co.
Hathaway Instr. Co.
Heiland Div.
Internat. Res. & Dev. Corp.
Kay Electric Co.
Krouse Testing Machine
Lance Prod.
L.A.B. Corp
M. B. Mfg. Co.
Massa Labs.
Martin-Hubbard Corp.
Miller Insts., William
New Brunswick Scient. Co.
RCA Div.
Rollin Co.
Southw. Indust. Electronic
Statham Devel. Corp.
Sticht Co.
Technical Instruments
Techno Inst. Co.
Testing Machines, Inc.
Walkirt Co.
Westinghouse Electric

VIBROGRAPHS

Askania-Werke A. G.
Baldwin-Lima-Hamilton
Cambridge Instr. Co.
Central Scientific Co.
Chicago Apparatus Co.
Commercial Research
Epic, Inc.
Hamilton Watch
Heiland Div.
Impact Register Co.
International Res. & Dev.
RCA Div.
Standard Science Supply
Vibration Specialty
Welch Mfg. Co., W. M.

VIBROMETERS

Advanced Electronics Inc.
Aircraft Electronics
Amer. Instr. Co.
Askania-Werke A. G.
Associated Research
Beta Corp.
Electrocon Corp.
Epic, Inc.
GE, Apparatus Sales
GE, Instrument Dept.
Haines Designed Prod.
Hamilton Watch
Hathaway Instr. Co.
Heiland Div.
International Res. & Dev.
Lab-Tronics
M.B. Mfg. Co
Martin-Hubbard Corp.
Massa Labs.
Scott, Inc, Hermon
Sticht Co.
Vibration Specialty
Walkirt Co.
Western Radiation Lab.
Westinghouse Electric

VIBROSCOPES

Aircraft Electronics
Airborne Instruments
Amperite Corp.
Brush Electronics
Bush Asso., G. F.
Carroll Co.
Century Geophysical
Coleman Instr. Co.
Commercial Engrg. Labs
Daytronic Corp.
Electro Products Labs.
Fisher Research Lab.
GE, Apparatus Sales
Gulton Mfg. Co.
Hamilton Watch
Heiland Div.
Humboldt Mfg. Co.
Insco Company
International Res. & Dev.
Lab-Tronics
M.B. Mfg. Co.
Massa Labs.
Sprengnether Instr Co.
Varo Mfg. Co.
Western Radiation Lab.
Wood Counter Labs.

VICAT NEEDLES, see Needles, Vicat

VISCOSIMETER BATHS, Constant-Temperature

Ace Glass
Amer. Instr. Co.
American Research Corp.
Barnstead Still
Brabender Corp.
Cannon Instr. Co.
Central Scientific Co.
Chicago Surgical & Elec.
Coleman Instr. Co.
Drage Products
Eitzen Co.
Electric Hotpack Co.
Fish-Schurman Corp.
Fisher Scientific Corp.
Gardner Lab.
Greiner Co., Emil
Hallikainen Insts.
Humboldt Mfg. Co.
Kahn & Co.
Koehler Instr. Co.
Labline, Inc.
Modern Electrical Lab.
Modern Lab Equipt. Co.
Palo Lab. Supplies
Philadelphia Scientific
Powers Regulator Co.
Precision Scientific Co.
Process & Instruments
Refrigeration Systems
Research Specialties
Ruska Instruments
Sargent & Co., E. H.
Scientific Development
Scientific Glass App.
Technical Equip. Co.
Tenney Eng.
Thwing-Albert
Wilkens-Anderson
Zeiss Inc., Carl

VISCOSIMETER (For Plastic Flow Fluids)

Ace Glass
Bendix Aviation Corp.
Brookfield Engrg. Labs.
Burrell Corp.
Doelcam Div.
Drage Products
Electro-Physics Co.
Ferranti Electric
Fischer & Porter Co.
Fish-Schurman Corp.
Gardner Lab.
GE, Apparatus Sales
GE, Instrument Dept.
Hagan Corp.
Indust. Test Equipt. Co.
Kontes Glass
Norcross Corp.
Precision Scientific Co.
Process & Instruments
Scientific Instr. Co.
Southwestern Ind. Elec.
Testing Machines, Inc.

VISCOSIMETERS, including Brookfield, Engler, Fenske, Ford (for Paint), Hoeppler, MacMichael, Ostwald, Redwood, Scott, Storme, Ubbelohde

Ace Glass
Aloe Co., A. S.
American Inst. Co.
Bendix Aviation Corp.
Berkeley Div.
Boekel & Co.
Brabender Corp.
Bristol Co.
Brookfield Engrg. Labs.
Cannon Instr. Co.
Central Scientific
Coleman Insts. Inc.
Eitzen Co., L. C.
Ferranti Electric
Fish-Schurman
Fisher Scientific
Foxboro Co.
Gaertner Scient. Corp.
Gardner Lab.
GE Instrument Dept.
Gerin Corp.
Greiner Co., Emil
Hiergesell & Sons
Humboldt Mfg. Co.
Indust. Test Equipt. Co.
Industro-Scientific Co.
Instr. Devel. & Mfg. Corp.
Kimble Glass
Koehler Instr. Co.
Kontes Glass
Labline, Inc.
Owens-Illinois Glass Co.
Phoenix Prec. Instr. Co.
Precision Scientific
Process & Instruments
Ruska Instr. Corp.
Sargent & Co., E. H.
Scientific Development
Scientific Instr. Co.
Scott Testers
Technical Equipt. Co.
Testing Machines, Inc.

VISCOSIMETERS, Kinematic

Ace Glass
American Instr. Co.
Cannon Instr. Co.
Commercial Res. Div.
Ferranti Electric
Fisher Scientific
Freas Glass Works
Gardner Lab.
Greiner Co., Emil
Hallikanien Insts.
Hiergesell & Sons
Indust. Test Equipt. Co.
Koehler Instr. Co.
Kontes Glass
Labline, Inc.
Modern Lab. Equipt. Co.
Precision Scientific Co.
Scientific Development
Scientific Glass App.
Technical Equipt. Co.

VISCOSIMETERS, Recording

Bendix, Cincinnati Div.
Brabender Corp.
Bristol Co.
Brookfield Engrg. Labs.
Coleman Insts. Inc.
Doelcam Div.
Drage Products
Electro-Physics Co.
Gaertner Scientific
Hagan Corp.
Hallikainen Inst.
Hayes Scientific App.
Instrument Dev. Labs.
Indust. Test Equipt. Co.
Norcross Corp.
Precision Scientific

VISCOSIMETERS, Saybolt

Amer. Instr. Co.
Boekel & Co.
Bristol Co.
Central Scientific
Corning Glass Works
Eitzen Co., Louis C.
Fisher Scientific
Freas Glass Works
Hallikainen Insts.
Hiergesell & Sons
Humboldt Mfg. Co.
Kimble Glass
Koehler Instr. Co.
Kontes Glass
Labline, Inc.
Monarch Mfg. Wks.
Owens-Illinois Glass
Precision Scientific
Sargent & Co., E. H.
Scientific Glass App.
Zuhr, Inc., Henry

VISCOSIMETERS, Ultrasonic

Bendix, Cinicinnati Div.
Gulton Mfg. Corp.
Hall Sonic Engrg. Co.

VISCOSIMETERS, Zahn

Central Scientific
Fisher Scientific
GE, Apparatus Sales
GE, Instrument Dept.
Kontes Glass
Precision Scientific
Sargent & Co., E. H.

VISCOSITY CONTROLLERS

Askania Reg. Co.
Autom. Temp. Control
Bailey Meter Co.
Bendix, Cincinnati Div.
Berkeley Div.
Brabender Corp.
Bristol Co.
Brookfield Engrg. Labs.
Doelcam Div.
Drage Products
Electric Eye Equipt.
Fischer & Porter Co.
Foxboro Co.
General Controls
GE
Hall-Sonic Engrg. Co.
Hallikainen Inst.
Norcross Corp.
Perfex Corp.
R. K. L. Valve & Mfg. Co.
Scientific Instr.
Taylor Instr. Cos.
Visco-Meter Corp.

VISCOSITY GAGES, see Viscosimeters

VISCOSITY TUBES

Ace Glass
Bellco Glass Co.
Berkeley Div.
Cargille, R. P.
Coleman Insts., Inc.
Eitzen Co., Louis Co.
Fisher Scientific
Fish-Schurman Corp.
Gardner Laboratory
Humboldt Mfg. Co.
Koehler Instr. Co.
Kontes Glass
Labline, Inc.
Owens-Illinois Glass
Phoenix Prec. Instr. Co.
Precision Scientific
Scientific Development
Scientific Glass App.

VOLTAGE COMPARATORS

ACF Electronics Div.
Arma Corp.
Boonton Radio Corp.
Borden Engrg. Co.
Cal-Tronics Corp.
Daystrom Instr. Co.
DoAll Co.
Electro-Pulse, Inc.
Electro Insts., Inc.
Engineering & Res. Corp.
Feller Engrg. Co.
Griswold Mfg. Co.
Helipot Div.
Hycon Electronics
Kepco Labs.
Phaostron Co.
Rainhart Co.
Rheem Mfg. Co.
Rubicon Co.
Scott, Inc., Hermon H.
Sensitive Res. Instr.
Shallcross Mfg. Co.
Sheffield Corp.
Simpson Electric
Thordarson-Meissner
Wiancko Engrg. Co.

VOLTAGE DETECTORS, see Null Detectors

VOLTAGE DIVIDERS, see Attenuators, also Potentiometers (Resistors)

VOLTAGE, HIGH (above 2300 volts), MEASURING DEVICES and/or INDICATORS

Acton Labs.
Advance Electronics
Associated Research
Atomic Instr. Co.
Ballantine Labs.
Barber Labs., Alfred
Beta Electric
Bradshaw Instruments
Cal-Tronics Corp.
Dale Instruments
Davenport Mfg. Co.
Dittmore & Freimuth
Electronic Instr. Co
Federal Telephone
Feiler Engrg. Co.
Ferranti Electric
Freed Transformer
Fox Valley Inst.
GE, Apparatus Sales
General Physical Lab.
Hewlett-Packard Co.
Hickok Elect. Instr. Co.
International Resistance
Jennings Radio Mfg. Co.
Keithley Insts., Inc.
Leeds & Northrup
Meters, Inc.
Opad Electric
Peschel Electronics, Inc.
Phaostron Co.
Philco Corp.
Precise Development
Precise Measurements Co.
Precision Apparatus
Radio City Prod. Co.
RCA Div.
Rawson Electcl. Instr.
Reiner Electronics

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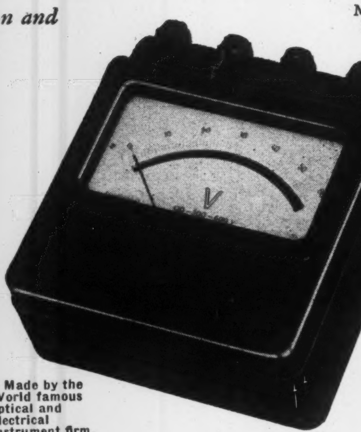

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Roller-Smith
Rubicon Co.
Sensitive Res. Instr
Shallcross Mfg.
Sherron Metallic
Simpson Electric
Spellman Television
Sylvania Elec. Prod.
Triplett Electcl. Instr.
Vectron, Inc.
Westinghouse Electric

VOLTAGE, HIGH (above 2300 volts), TESTING DEVICES

Advanced Electronics Inc.
American Transformer
Asch Equipment Co.
Associated Research
Beta Electric
Bradshaw Instruments
Cal-Tronics Corp.
Davenport Mfg. Co.
Del Electronics
Detectolab, Inc.
Dittmore & Freimuth
Electronic Instr. Co.
El Mec Laboratories
Feiler Engrg. Co.
GE, Apparatus Sales
Industrial Insts., Inc.
Industrial Test Equipt.
International Resistance
Keithley Instruments
MacLeod & Hanopol
Magnatran Inc.
Manson Labs.
Multi-Amp Corp.
Opad Electric
Peschel Electronics, Inc.
Phaostron Co.
Precise Measurements Co.
Precision Apparatus
Radio City Prod. Co.
Raytheon Mfg. Co.
Reiner Electronics
Roller-Smith
Rubicon Co.
Sensitive Res. Instr.
Shallcross Mfg. Co.
Sherron Metallic
Simpson Electric
Spellman Television
States Co.
Superior Electric
Thordarson-Meissner
Triplett Elect. Instr.
Westinghouse Electric
Weston Electcl. Instr.

VOLTAGE REGULATORS, Glow Tube

Anton Electronic Labs.
Chatham Electronics Div.
Electronic Prods. Co.
GE, Tube Dept.
Kepco Labs.
Mercury Electronic Co.
Nuclear Devel. Lab.
Raytheon Tube Div.
Rheem Mfg. Co.
Victoreen Instr. Co.

VOLTAGE REGULATORS, Line Voltage (see also Transformers, Constant Voltage)

ACF Electronics
Acme Electric Corp.
Allis-Chalmers
Ameri. Machine & Fdry.
Amer. Transformer
Amperite Corp.
Amplifier Co.
Anton Electronic Labs.
Askania Reg. Co.
Assembly Products
Authorized Mfrs. Service
Automatic Electric
Barber-Colman
Bart-Messing
Beck Co.
Bendix, Eclipse Pioneer
Bendix, Red Bank
Beva Laboratory
Bogue Elect. Mfg. Co.
Boonton Radio Corp.
Bradley Labs.
Burlington Instr. Corp.
Burroughs Corp.
Cal-Tronics Corp.
Chicago Std. Transf. Corp.
Clarostat Mfg. Co.
Clippard Instr. Lab.
Collins Radio
Commercial Research
Communication Meas. Lab.
Control Corp.
Curtiss-Wright Corp.
Cutler-Hammer
Devtronics, Inc.
Doelcam Div.
Dressen Barnes Corp.
Electric Regulator Corp.
Electrical & Physical Instr.
Electronic Associates
Electronic Measmt. Co.
Electronic Products
Electronic Res. Assoc.
Electronic Specialty Co.
Electrosig Corp.
El Mec Laboratories
El-Tronics, Inc.
Federal Telephone
Ferris Instr. Corp.
Fielden Instr. Div.
Fredericks, George
Furst Electronic
G-V Controls, Inc.
GE, Apparatus Sales
General Megnetics Inc.
General Radio
Hanson-Gorrill-Brian
Hastings-Raydist
Helipot Div.
Hevi-Duty Electric
Inet, Inc.
Instruments Inc.
Internationl Resistance
Jersey City Tech. Lab
Jo-Line Tools
Kay-Lab
Kellogg Switchboard
Kemlite Labs.
Kepco Labs.
Laboratory for Electronics
La Marche Mfg.
Lambda Electronics
Lewis & Co., J. B.
Magnetic Amplifiers, Inc.
Magnetic Instr. Co.
Magnetic Research Corp.
Martin & Co.
Maxson Corp., W. L.
Mercury Electronic Co.
Metrotype Corp.
NJE Corp.
North Amer. Philips Co.
Nuclear Chicago
Oregon Electronic
Peschel Electronics
Perkin Engrg. Co.
Polarad Electronics
Precise Measmts. Co.
Process & Instruments
Radiation Instr. Dev. Lab.
RCA Div.
Raytheon Mfg. Co.
Research Specialties
Richardson-Allen
Rockwell Engr.
Rudolph & Sons, O. C.
Shallcross Mfg. Co.
Sherron Metallic
Sola Electric
Sorensen & Co.
Standard Elect. Time Co.
Sterling Engrg. Co.
Streeter-Amet Co.
Superior Electric
Sylvania Elect. Prods.
TAB
Teletronics Lab.
Thermador Electcl. Mfg. Co.
Thordarson-Meissner
Timely Insts. & Conts. Co.
Transmag Div.
United Electric
United Transformer Corp.
Varian Assocs.
Varo Mfg. Co.
Vickers Elec. Div.
Victoreen Inst. Co.
WacLine, Inc.
Walkirt Co.
Ward Leonard
Westinghouse Electric
Wilson & Co., G. C.
Yellow Spring Instr. Co.

VOLTAGE STANDARDS, see Standard Cells

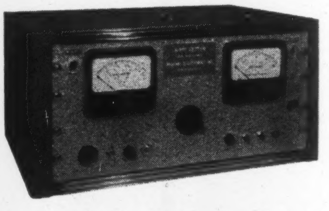
VOLTAGE SUPPLIES, see Power Supplies

VOLT-AMMETERS

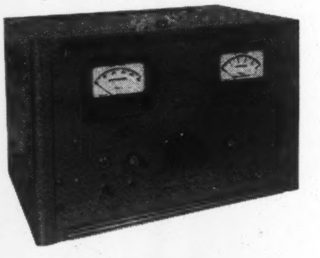
Amer. Elect. Sales Co.
Assembly Products
Associated Research, Inc.
Beckman Instruments
Beede Electcl. Instr. Co.
Bradshaw Instruments
Bristol Co.
Burlington Instr. Co.
Chicago Indust. Instr. Co.
Clough-Brengle Co.
Columbia Electric Mfg.
Computer Co. of Amer.
Dale Instruments
Davenport Mfg. Co.
De Jur-Amsco Corp.
Dittmore Freimuth Corp.
Electro-Mechanical Insts.
Electro-Tech Equipt. Co.
Electronic Dev. Lab.
Electronic Instr. Co.
Engelhard, Inc., Charles
Esterline-Angus Co.
Feiler Engrg. Co.
Fox Valley Inst.
GE, Apparatus Sales
Greibach Instruments
Hickok Electcl. Instr. Co.
International Instrument
Kay Lab.
Lewis Engrg. Co.
Marion Elec. Inst.
Martindale Elect. Co.
Meters, Inc.
Mil Instr. Corp.
Miller, M. C.
Phaostron Co.
Physics Research
Precision Apparatus Co.
Pyramid Instr. Corp.
Radio City Products
RCA Div.
Rawson Electcl. Instr.
Reiner Electronics
Rochester Mfg. Co.
Roller-Smith Co.
Sangamo Electric
Schauer Mfg. Corp.
Sendur Mfg. Co.
Sensitive Res. Instr.
Shurite Meters
Simpson Electric
Sticht Co.
Sun Electric
Supreme Instruments
Triplett Elect. Instr. Co.
United Electric
United Optical Mfg.
U. S. Gauge Div.

Complete series of
HIPOT TESTERS
and
CORONA TEST SETS

- ☆ HV Test Sets, AC, DC and AC/DC
- ☆ Non-destructive Sensitive Hi-pot Testers with 5μ-a circuit breaker
- ☆ Corona Test Sets



- ☆ Continuous Insulation Testers
- ☆ Insulation Tester and Fault Indicator
- ☆ Motorized Output Control Panel
- ☆ Audiotone Continuity/Leakage Tester



- ☆ Electronic Rheostats
- ☆ High Potential Test Sticks
- ☆ DC High Potential Test and Cable Fault Sets
- ☆ Universal Power Supplies
- ☆ Electronic Relays

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PESCHEL ELECTRONICS, Inc.
13 Garden Street
New Rochelle, New York
Phone NE 6-3342

For more information circle **421** on inquiry card.

Welch Mfg. Co., W. M.
Westberg Mfg. Co.
Westinghouse Electric
Weston Electcl. Instr.
Wheelco Instr. Co.

VOLT-AMPERE-HOUR METERS

Ferranti Electric
GE
Minneapolis-Honeywell
Roller-Smith
Sangamo Electric
Simpson Electric
Westinghouse Electric

VOLT-AMPERE METERS Reactive

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Dittmore & Freimuth
Electrical Facilities, Inc.
Esterline-Angus Co.
GE, Apparatus Sales
GE, Instrument Dept.
Hickok Electr. Instr.
Landis & Gyr, Inc.
Roller-Smith
Sangamo Electric
Sensitive Research Inst.
Simpson Electric
Triplett Electr. Instr.
Welch Mfg. Co., W. M.
Westinghouse Electric
Weston Electcl. Instr.

VOLTMETERS, AC, Rectifier

Assembly Prod., Inc.
Associated Research
Ballantine Labs.
Beede Electcl. Instr. Co.
Boonton Radio Corp.
Bradshaw Instruments
Bristol Co.
Burlington Instr. Co.
Chicago Indust. Instr. Co.
Dale Instr. Co.
Davenport Mfg. Co.
De Jur-Amsco Corp.
Dittmore & Freimuth
Elec. Design & Mfg.
Electronic Eng'ng. Service
Electro Insts.
Electronic Instr. Co.
Endevco Corp.
Esterline-Angus
Feiler Engrg. Co.
Fisher Res. Lab.
Gar Electcl. Instr.
GE
General Radio Co.
Helipot Div.
Hewlett-Packard
Hickok Electcl. Instr.
International Instruments
Kay-Lab
Mag Electric
Marion Elec. Instr. Co.
Meters, Inc.
Mil Instr. Corp.
Norton Elect. Instr. Co.
Pace Electrical Inst.
Phaostron Co.
Physics Research
Precision Apparatus Co.
RCA Div.
Roller-Smith
Sendur Mfg. Co.
Sensitive Res. Instr.
Shallcross Mfg.
Shasta Div.
Simpson Electric
Sterling Mfg. Co.
Sun Electric
Supreme, Inc.
Sylvania Elect. Prods.
Triplett Elect. Instr. Co.
United Optical Mfg.
U. S. Gauge Div.
WacLine, Inc.
Welch Mfg. Co., W. M.
Westinghouse Electric
Weston Electcl. Instr.

VOLTMETERS, Contact Making, see D'Arsonval-type Controllers

VOLTMETERS, Digital

Chatham Electronics Div.
Computer Corp. of Amer.
Datran Engrg.
Electro Insts.
Franklin Electronics
Furst Electronics
Hanson-Gorrill-Brian
Hycon Electronics
Lab. for Electronics
Leeds & Northrup
Link Aviation
Moseley Co.
Non-Linear Systems
Phaostron Co.
Reeves Instr. Corp.
Telecomputing Corp.
Wang Labs.. Inc.
Weston Electcl. Instr.

VOLTMETERS, Electrostatic

Assembly Products
Cambridge Instr. Co.
Custom Scient. Insts.
Dittmore & Freimuth
Ferranti Electric
GE
General Electronic
Hathaway Instr. Co.
Hickok Elect. Instr. Co.
Keithley Instruments
Landsverk Electrometer
Rawson Electcl. Instr.
Scientific Specialties
Sensitive Res. Instr.
Simpson Electric
Sticht Co., Herman H.
United Optical Mfg.
WacLine, Inc.
Weston Electcl. Instr.

VOLTMETERS, Indicating

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Barber Colman
Beede Electcl. Instr. Co.
Bristol Co.
Burlington Instr. Co.
Cal-Tronics Corp.
Chicago Indust. Instr.
Clough-Brengle Co.
Columbia Elect. Mfg.
Control Corp.
Dale Instruments
De Jur-Amsco Corp.
Dittmore & Freimuth
Doelcam Div.
Elec. Design & Mfg.
Electro-Mechanical Inst.
Electronic Development
Electronic Measmts. Co.
Endevco Corp.
Feiler Engrg. Co.
Ferranti Electric
Fielden Instr. Div.
GE, Apparatus Sales
GE, Instrument Dept.
Helipot Div.
Hickok Electcl. Instr. Co.
Hycon Electronics
Industrial Control Co.
International Instruments
J-B-T Insts.
Kay Electric
Keithley Instruments
Lewis Engrg. Co.
Link Aviation
Mag Electric
Marion Elec. Instr. Co.
Measurements Corp.
Meters, Inc.
Mil Instr. Corp.
Miller, M. C.
Niagara Electrical Instr.
Norton Electcl. Instr.
Pace Electcl. Instr.
Phaostron Co.
Physics Research
Precision Apparatus Co.
Radio City Prod. Co.
Rawson Electcl. Instr.
RCA Tube Div.
Reiner Instr. Co.
Roller-Smith
Scott Inc., Herman Hosmer
Sendur Mfg.
Sensitive Res. Instr.
Shasta Div.
Shelby Inst.
Shurite Meters
Sierra Electronic
Simpson Electric
Southw. Indust. Electronic
Sterling Mfg. Co.
Sticht Co., Herman H.
Sun Electric
Supreme, Inc.
Texas Insts., Inc.
Triplett Elect. Instr. Co.
Triumph Mfg. Co.
United Electric
United Optical Mfg
U. S. Gauge Div.
WacLine, Inc.
Welch Mfg. Co., W. M.
Westinghouse Electric
Weston Electcl. Instr.
Wheelco Div.
Winslow Co.

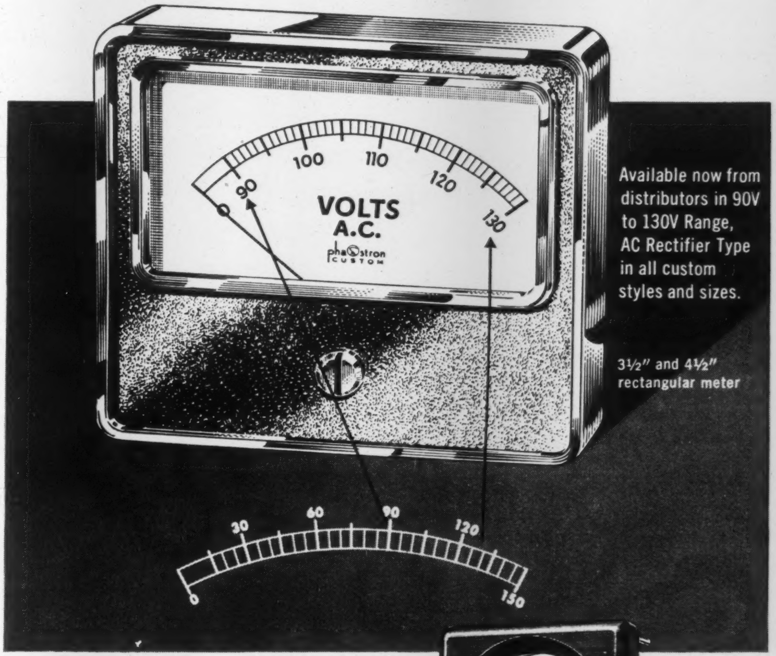
VOLTMETERS, Laboratory Standard

Advance Electronics
Ballantine Labs.
Beckman Instruments
Boonton Radio Corp.
Burlington Instr. Co.
Carroll Co.
Central Scientific
Computer Co. of Amer.
Davenport Mfg. Co.
Dittmore & Freimuth
Doelcam Div.
Electronic Instr. Co.
Engelhard Inc., Charles
Feiler Engrg. Co.
Ferranti Electric
Fluke Mfg. Co., John
Furst Electronics, Inc.
GE, Apparatus Sales
Greibach Instruments
Hickok Electcl. Instr. Co.
Industrial Control Co.
Kay Lab
Marion Electcl. Instr. Co.
Measurements Corp.
Non-Linear Systems
Phaostron Co.
Physics Research
RCA
Rawson Electcl. Instr.
Roller-Smith
Sensitive Res. Instr.
Simpson Electric
Southw. Indust. Electronic
Triplett Electcl. Instr.
United Optical Mfg.
U. S. Gauge Div.
Waveform, Inc.
Welch Mfg. Co., W. M.
Weston Electcl. Instr.

VOLTMETERS, Micro, RF

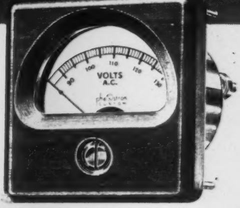
Ballantine Labs.
Beede Electcl. Instr.
Boonton Radio Corp.
Burlington Instr. Co.
Clarke Instr. Corp.
Computer Co. of Amer.
Elect. Des. & Mfg. Co.
Empire Devices

NEW PHAOSTRON
EXPANDED SCALE
AC Voltmeter



Available now from distributors in 90V to 130V Range, AC Rectifier Type in all custom styles and sizes.

3½" and 4½" rectangular meter

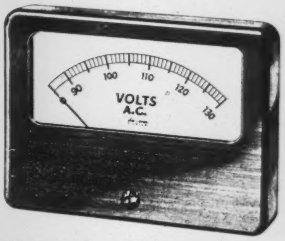


2½" or 3½" square meter

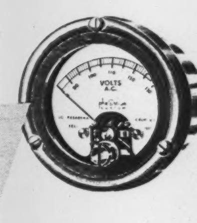
NOW!... all the time-tested proven Phaostron features... PLUS UP TO TEN TIMES GREATER READABILITY for greatly increased accuracy!

Phaostron has squeezed down that under 90V portion of the scale, where you don't need it, and expanded the section where you need it most—between 90 and 130V. Precisely calibrated 1 volt scale increments provide greater reading accuracy. Wide frequency range—linearity—true rms reading and Phaostron craftsman construction.

Phaostron Custom Panel Meters, with expanded scale, 90V to 130V AC rms, are available in nine types at your Parts Distributor. For special requirements, write to the Product Development Department for practical recommendations.



6" rectangular meter



2½" or 3½" round meter

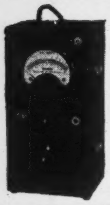
PHAOSTRON

PHAOSTRON INSTRUMENT & ELECTRONIC CO., 151 PASADENA AVE., SOUTH PASADENA, CALIF.
For more information circle 422 on inquiry card.

BALLANTINE VOLTMETERS

Famous for SENSITIVITY • ACCURACY • STABILITY

AUDIO to 150 kc — MODEL 300



Voltage Range	1mv—100v
Frequency Range	10cps—150kc
Accuracy	2% ENTIRE RANGE
Input Impedance	½ meg shunted by 30μμf

SUB-AUDIO to 150 kc — MODEL 302B

Battery Operated

Voltage Range	100μv—100v
Frequency Range	2cps—150kc
Accuracy	3% 5cps—100kc 5% elsewhere
Input Impedance	2 meg shunted by 15 μμf*

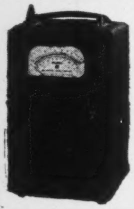
**Shunt capacitance, 8 μμf on all ranges except two most sensitive ranges*

PEAK-to-PEAK — MODEL 305

Voltage Range	1mv—1000v pk-to-pk
Frequency Range	10cps—100kc (sine wave)
Pulse width	3μsec—250μsec
Min Rep Rate	20 pulses per sec
Accuracy	5% for pulses
Input Impedance	2 meg shunted by 15 μμf*

**Shunt capacitance, 8 μμf on all ranges except two most sensitive ranges*

AUDIO to 2 mc — MODEL 310A



Voltage Range	100 μv—100 v *Down to 40 μv at reduced accuracy*
Frequency Range	10 cps—2 mc *As null detector 5 cps.—4 mc*
Accuracy	3% 10 cps—1 mc 5% elsewhere
Input Impedance	2 meg shunted by 15 μμf*

**Shunt capacitance, 8 μμf on all ranges except two most sensitive ranges*

AUDIO to 6 mc — MODEL 314

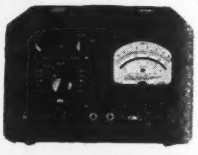
Voltage Range	1mv—1000v (100μv—1mv without probe)
Frequency Range	15cps—6mc
Accuracy	3% 15cps—3mc 5% elsewhere
Input Impedance	11 meg shunted by 7.5 μμf (1 meg shunted by 25 μμf without probe)

INFRASONIC to 30 kc — MODEL 316

Voltage Range	20 mv—200 v pk-to-pk
Frequency Range	0.05 cps—30 kc *(Down to .01 cps with corrections)*
Accuracy	3% ENTIRE RANGE
Input Impedance	10 meg shunted by 19 μμf *or 40 μμf depending on setting*

ACCESSORIES are available for all voltmeters to extend voltage measurements down to 20 μv and up to 42.5 kv, and to measure currents from 0.1 μamp to 10 amp, and to provide DC from the Model 300 Voltmeter to drive external recorders or remotely located meters.

TRUE RMS INDICATION — MODEL 320



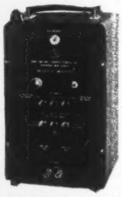
Voltage Range	100 μv—320 v
Frequency Range	5 cps—500 kc
Accuracy	3% 15 cps—150 kc 5% elsewhere
Stability of Internal Calibrator	0.5%
Input Impedance	10 megs shunted by 25 μμf below 10 mv 10 megs shunted by 8 μμf above 10 mv

DC & AC PRECISION CALIBRATOR MODEL 420

Voltage Range	0-10 v RMS; Pk-to-Pk; or DC
Frequency (Std. Model)	1 kc *(other values on special order)*
Accuracy (long term)	Better than 0.5% above 1 mv
Distortion and Hum	Less than 0.5%
Setting Resolution	Approaches 0.01% above 10 mv
Output Impedance (AC)	2-20 ohms depending on range setting

SENSITIVE INVERTER — MODEL 700

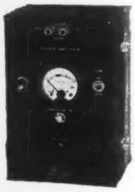
For Measuring DC Voltages when combined with any AC Voltmeter



Voltage Range	1μv—100v DC
Ratios DC Input to RMS Output	1:100 & 10:1
Accuracy	1% 100μv—100v
Input Resistance	>10 meg for 1:100 50 meg for 10:1

DECADE AMPLIFIER — MODEL 220B

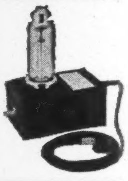
For Increasing the Sensitivity of any AC Voltmeter by 10 or 100 times



Voltage Range	10μv—50mv
Frequency Range	10cps—150kc
Accuracy	2% ENTIRE RANGE
Input Impedance	5 meg shunted by 15μμf

EXTRA HIGH VOLTAGE MULTIPLIER — MODEL 620

Usable with all Ballantine Voltmeters and many other types



Peak Voltage	60 kv
Dividing Ratio	10,000 to 1
Accuracy	2%
Frequency (Sine Waves)	60 cps—6 mc
Pulses	0 to 135 μsec duration
Input Capacitance	3.8 μμf

DIRECT READING CAPACITANCE METER MODEL 520

Capacitance Range	0.01 μμf to 12 μf *in 9 decade ranges covering over a billion to 1*
Accuracy	2% above 0.1 μμf 5% below 0.1 μμf
Capacitor Power Factor	0.15
Test Frequency	1 kc

WRITE FOR MORE DETAILED INFORMATION TO—

BALLANTINE LABORATORIES, INC.
112 FANNY ROAD, BOONTON, NEW JERSEY

For more information circle **423** on inquiry card.

Federal Telephone
Feiler Engrg. Corp.
Ferris Instr. Corp.
GE
General Radio
Hewlett-Packard
Hickok Electcl. Instr. Co.
Kay Electric
Leeds & Northrup
Millivac Instruments
Phaostron Co.
Rollin Co.
Shasta Div.
Sierra Electronic Corp.
Simpson Electric
Stoddart Aircraft Radio
Sylvania Elect. Prods.
Triplett Elect. Inst.
WacLine, Inc.
Welch Mfg. Co., W. M.
Westinghouse Electric

VOLTMETERS, Millivolts and Microvolts

Advance Electronics
Alto Scientific Co.
Asch Equipment Co.
Assembly Products
Associated Research
Ballantine Labs.
Barber-Colman
Beckman Instruments
Beckman & Whitley
Beede Electcl. Instr. Co.
Biddle Co., James G.
Boonton Radio Corp.
Bristol Co.
Brunswick Instruments
Burlington Instr. Co.
Cambridge Instr. Co.
Chicago Ind. Instr.
Columbus Products
Commercial Research
Computer Co. of Amer.
Dale Instruments
DeJur-Amsco Corp.
Dittmore & Freimuth
Doelcam Div.
DuMont Lab., Allen B.
Elect. Design & Mfg.
Electro Insts.
Electro-Mech. Instr. Co.
Electronic Devel. Co.
Engelhard, Chas.
Esterline-Angus
Federal Telephone & Radio
Feiler Engrg. Co.
Fielden Instr. Div.
Foxboro Co.
Franklin Electronics
Freed Transformer
Gar Electcl. Instr.
GE, Apparatus Sales
General Radio
Greibach Instruments
Heath Co.
Hickok Electcl. Inst. Co.
Hycon Electronics
Industrial Control Co.
Internat. Instruments
J-B-T Insts.
Kay Electric
Kay Lab
Keithley Insts.
Lewis Engrg. Co.
Liston-Becker
Mag Electric
Manning, Maxwell & Moore
Marconi Instruments
Marion Electcl. Instr.
Measurements Corp.
Meters, Inc.
Microvolts, Inc.
Mil Instr. Corp.
Miller, M. C.
Millivac Instruments
Minneapolis-Honeywell
Moseley Co., F. L.
Non-Linear Systems
Norton Electcl. Instr.
Pace Electcl. Instr.
Phaostron Co.
Physics Research
Pimex, Inc.
Precision Apparatus Co.
Pyrometer Instr. Co.
RCA
Rawson Electcl. Instr.
Reiner Electronics
Roller-Smith
Scientific Specialties
Sensitive Res. Instr.
Shallcross Mfg. Co.
Shasta Div.
Sierra Electronic
Simpson Electric
Southw. Indust. Electronic
Standard Science Sup.
Sun Electric
Sun Mfg. Co.
Supreme, Inc.
Televiso Co.
Texas Insts., Inc.
Thwing-Albert
Trio Labs., Inc.
Triplett Electcl. Instr.
United Electric
United Optical Mfg.
WacLine, Inc.
Waveforms, Inc.
Welch Mfg. Co., W. M.
Westinghouse Electric
Weston Electcl. Instr.
Wheelco Div.

VOLTMETERS, Millivoltmeters, AC, Rectifier

Assembly Products
Ballantine Labs.
Beckman Instruments
Beede Electcl. Instr.
Boonton Radio Corp.
Bristol Co.
Burlington Instruments
Chicago Indust. Instr.
Dale Instruments
DeJur-Amsco
Dittmore & Freimuth
DuMont Lab., Allen B.
Elect. Design & Mfg.
Electro Insts., Inc.
Electronic Development
Electronic Instr. Co.
Feiler Engrg. Co.
Fisher Res. Lab.
GE, Apparatus Sales
Gar Electcl. Instr. Co.
Hewlett-Packard
Internat. Instruments
Kay Lab
Mag Electric
Marion Electcl. Instr.
Mil Instr. Corp.
Pace Electcl. Instr.
Phaostron Co.
Physics Research
Precision Apparatus Co.
Roller-Smith
Sensitive Res. Instr.
Shasta Div.
Simpson Electric
Southw. Indust. Electronic
Special Instruments Lab.
Sun Electric
Supreme, Inc.
Triplett Electcl. Instr. Co.
United Optical Mfg.
WacLine, Inc.
Welch Mfg. Co., W. M.
Weston Electcl. Instr.

VOLTMETERS, Oxide Rectifier

Beede Electcl. Instr.
Burlington Instr. Co.
Chicago Indust. Instr.
Clough-Brengle
Dale Instruments
DeJur-Amsco Corp.
Elect. Design & Mfg.
Electronic Dev. Lab.
Esterline-Angus
Feiler Engrg. Co.
GE
General Radio
Hickok Electcl. Instr.
Marion Electcl. Instr.
Meters, Inc.
Pace Electcl. Instr.
Phaostron Co.
Physics Research
Precision Apparatus Co.
Reiner Electronics
Roller-Smith
Simpson Electric
Sun Mfg. Co.
Supreme Inc.
Triplett Electcl. Instr.
Triumph Mfg. Co.
United Electric
Westinghouse Electric

VOLTMETERS, Peak

Ballantine Labs.
Barber Labs., Alfred
Beta Electric
Clark Instr. Corp.
Clough-Brengle
Control Devices
Davenport Mfg. Co.
Electronic Dev. Lab.
Endevco Corp.
Federal Telephone
Feiler Engrg. Co.
Fox Valley Instr. Co.
Franklin Electronics
GE
General Radio
Gertsch Products
Hewlett-Packard
Hickok Electcl. Instr.
Industrial Devices Inc.
Jennings Radio Mfg. Co.
Kay Electric
Measurements Corp.
Non-Linear Systems
Physics Research
Radio City Products
RCA
Rawson Electcl. Instr.
Rowe Engrg. Co.
Sensitive Res. Instr.
Shepard Labs.
Simpson Electric
Supreme, Inc.
Triplett Electcl. Instr.

VOLTMETERS, Recording

Alfax Paper & Engrg.
Audio Instr. Co.
Barber-Colman
Bristol Co.
Brush Electronic
Cambridge Instr. Co.
Electrical Dev. Co.
Electro Insts., Inc.
Endevco Corp.
Engelhard, Chas.
Esterline-Angus
Franklin Electronics
Fielden Instr. Div.
GE, Apparatus Sales
Hycon Electronics
Larson Instr. Div.
Leeds & Northrup
Massa Labs.
Millivac Instr. Co.
Non-Linear Systems
Physics Research
Precise Measurements Co.
Roller-Smith
Sanborn Co.
Techn. Prods. Co.
Texas Insts., Inc.
Westinghouse Electric

VOLTMETERS, Thermionic Rectifier

Ballantine Labs
Barber Labs., Alfred
Cambridge Instr. Co.
Chicago Indust. Instr.
Clippard Instr. Lab.
Electronic Dev. Lab.
Fluke Mfg. Co.,, John
GE
General Radio Co.
Measurements Corp.
Meters, Inc.
Physics Research
Simpson Electric
Sylvania Elect. Prods.
Triplett Elect. Instr.

VOLTMETERS, Thermo

Amer. Elect. Sales Co.
Assembly Products
Beede Elect. Instr. Co.
Cambridge Instr. Co.
Dale Instruments
De Jur-Amsco
Electronic Development
GE
Greibach Instruments
Lewis Engrg. Co.
Meters, Inc.
Physics Research
Pimex, Inc.
Pyrometer Instr. Co.
Rawson Electcl. Instr.
Sangamo Electric
Sensitive Res. Instr.
Sun Manufacturing
Triplett Electcl. Instr.
WacLine, Inc.
Welch Mfg. Co., W. M.
Westinghouse Electric
Weston Electcl Instr.
Wheelco Instr. Div.

VOLTMETERS, Vacuum Tube, see Vacuum Tube Voltmeters

VOLT-OHMMETERS

Amer. Chronoscope
Associated Research
Beckman Instruments
Beede Electcl. Instr.
Beta Electric
Bradshaw Instruments
Burlington Instr. Co.
Chicago Indust. Instr.
Clippard Instr. Lab.
Clough-Brengle
Co-Design Corp.
Dale Instruments
Daven Co.
DeJur-Amsco
Delmhorst Instr. Co.
Douglas Radio Labs.
Electro Instruments
Electro Products
Electro Tec. Equipt. Co.
Electronic Dev. Lab.
Electronic Engrg. Serv.
Electronic Instr. Co.
Electronic Measurements
Esterline-Angus
Feiler Engrg. Co.
Freed Transformer
GE
General Radio
Greibach Instruments
Hickok Electcl. Instr.
Hycon Electronics
Industrial Control Co.
Industrial Instruments Inc.
Instrument Labs.
Internat. Instruments Inc.
Jackson Electcl. Instr.
Keithley Instruments
Marconi Instruments
Martindale Electric
Meters, Inc.
Mil Instruments Corp.
Millivac, Inst.
New London Instr. Co.
Non-Linear Systems
Phaostron Co.
Philco Corp.
Physics Research
Pimex, Inc.
Precise Measurements
Precision Apparatus Co.
Radio City Products
RCA, Tube Div.
Rawson Electcl. Instr.
Reiner Electronics Co.
Roller-Smith
Sensitive Res. Co.
Shallcross Mfg. Co.
Shasta Div.
Sherron Metallic
Shurite Meters
Simpson Electric
Southw. Indust. Elect.
Sticht Co., Herman H.
Sun Mfg. Co.
Superior Instruments
Supreme, Inc.
Triplett Electcl. Instr.
Triumph Mfg. Co.
United Optical Mfg.
Universal Instr. Co.
Welch Mfg. Co., W. M.
Western Radiation Labs.
Weston Electcl. Instr.
Yonkers Industries, Inc.

VOLT-OHM-MILLIAMMETERS

Acton Labs.
Air-O-Tronics
Allied Radio Corp.
Amer. Chronoscope Corp.
Beede Electcl. Instr.
Bradshaw Instruments
Bristol Co.
Carol Electronics
Chicago Indust. Instr.
Cole Instr. Co.
Columbus Products
Computer Co. of Amer.
Dale Instruments
Douglas Radio Labs.
Electronic Development
Electronic Engrg. Co.
Electronic Instr. Co
Electronic Measmts. Corp.
Federal Telephone
Feiler Engrg. Co.
Greibach Instruments
Hewlett-Packard
Hickok Electcl. Instr.
Instrument Laboratories
Jackson Elect. Instr.
Mag Electric
Marion Electcl. Instr.
Martindale Electric
Meters, Inc.
Mil Instr. Corp.
Millivac Instruments
Non-Linear Systems
Phaostron Co.
Philco Corp.
Physics Research
Pimex, Inc.
Precise Development
Precision Apparatus Co.
Precision Electronics
Radio City Products
RCA, Tube Div.
Reiner Electronics Co.
Roller-Smith
Simpson Electric
Sticht Co., Herman
Supreme, Inc.
Sylvania Elect. Prods.
Technology Instr. Co.
Triplett Electcl. Instr.
United Optical Mfg.
Westinghouse Electric
Weston Electcl. Instr.
Yonkers Industries

VOLUME CONTROLS, see Potentiometers (Resistors)

VOLUME INDICATORS, Sound, see Sound

VOLUME STANDARDS, see Standards, Volume

VSWR INDICATORS

Allied Radio Corp.
Color Television, Inc.
Hewlett-Packard
Industrial Control Co.
Marconi Instruments
Polytechnic Res. & Dev. Co.
Sierra Electronic Corp.

WASHERS, Amber.

Felt Products Mfg.
Polymer Corp. of Pa.
Waltham Screw Co.

WASHERS, Lead

Alpha Metals, Inc.
Auburn Mfg. Co.
Autoscrew Co.
Bar-Ray Products
Belmont Smg. & Refg.
Division Lead Co.
Federal Screw Prod. Co.
Federated Metals
Felt Products
Heitz, Inc., Karl
Hi-Grade Alloy Corp.
Koehler Instr. Co.
Stafford Co.
Stimpson Co., Edwin B.
Stronghold Screw Prods.
United Screw & Bolt
Whitehead Stamping

WASHERS, Precious Metal

Amer. Platinum Wks.
Amer. Silver Co.
Auburn Mfg. Co.
Autoscrew Co.
Baker & Co., Inc.
Bishop Platinum Wks.
Federal Screw Prods. Co.
General Plate Div.
Gibson Electric
Handy & Harman
Heitz, Karl, Inc.
Keystone Carbon Co.
Modern Tech. Supply
Ney Co.
Research Devel. Mfg.
Secon Metal Corp.
Stimpson Co
Swissomatic Products
Waltham Screw Co.
Whitehead Stamping
Wilson Co., H. A.

WASTE TREATMENT INSTRUMENTS

Amer. Meter Co.
B-I-F Industries
Bailey Meter Co.
Bristol Co.
Builders-Providence
Fischer & Porter Co.
Foxboro Co.
Hagan Corp.
Hays, Corp.
Leeds & Northrup
Leupold & Stevens
Mason-Neilan Div.
Minneapolis-Honyewell
  Indust. Div.
Penn. Insts. Div.
Precision Scientific
R. K.L. Valve Mfg. Co.
Simplex Valve & Meter
Wallace & Tiernan

WATCH RATE TESTERS

American Time Prods.
G. M. Mfg. Co.
Gordon Enterprises
Paulson & Co.
Potter Instr. Co.

WATCHES, Chronometer, including Marine (see also Clocks)

Allied Prods. Div.
Bliss & Co.
Clebar Watch Co.
Ducommun Co., M.
Elgin National Watch
Jaeger Watch Co.
Jardur Import Co.
Lafayette Instr. Co.
Negus, T. S. & J. D.
Sticht Co.
Technical Instruments
Wakmann Watch Co.

WATCHES, Stop

Allied Prods. Div.
Aristo Import Co.
Biddle Co., James G.
Central Scientific
Clebar Watch Co.
Dietzgen Co., Eugene
Ducommun Co., M.
Eitzen Co., Louis C.
Elec. Facilities, Inc.
Elgin National Watch
Fish-Schurman
Fisher Scientific
Gaertner Scientific
Gallien, R. P.
General Scientific Equipt.
Gordon Enterprises
Jaeger Watch Co.
Jardur Import Co.
Lafayette Instr. Co.
Martindale Elect. Co.
Negus, T. S. & J. D.
Precision Scientific
Racine & Co., Jules
Scherr Co., Inc.
Speidel & Co.
Standard Elec. Time
Sticht Co., Herman H.
Stoelting Co., C. H.
Testrite Instr. Co.
Wakmann Watch Co.
Weston Electcl. Instr.
White Co.
Zernickow Co.

WATCHES, Stop-Electric

American Chronoscope
Central Scientific Co.
Clebar Watch Co.
Cramer Controls Co.
Elgin Natl. Watch Co.
Jaeger Watch Co.
Jardur Import
Lafayette Instr. Co.
Precision Scientific Co.
Standard Elect. Time
Sticht Co.
Stoelting Co., C. H.
Thompson Clock Co.
Weston Electcl. Instr.

WATCHMAKER'S SUPPLIES

Amer. Laubscher
Bausch & Lomb
Bayside Watch Tool
Borel & Co., Jules
Gallien, R. P.
Hairspring Vibrating
Jadow, Inc.
Kastner, Charles
L & R Mfg. Co.
Levin & Son, Louis
Marshall Co., C. & E.
Modern Tech. Supply
Newall Mfg. Co.
New Jersey Jewelers' Sup.
Nye, Inc., William F.
Sickles & Sons, Inc., M.
Swissomatic Products
Waples, Wm. S.
Zenith Mfg. & Chem. Corp.

WATCHMAKER'S TOOLS (see also Jewelers' Lathes)

Bayside Watch Tool
Borel & Co., Jules
Derbyshire, Inc., F. W.
Dixon, Inc., William
Fineisen, A. R.
Gallien, R. P.
Gilman Engrg. & Mfg.
Grobet File Co. of Amer.
Gustafson Mfg. Co.
Hirschmann Co., Carl
J & S Tool Co.
Jadow, Inc.
Jensen Mfg. Co.
Kastner, Charles
Kendrick & Davis Co.
L & R Mfg. Co.
Levin & Sons, Louis
Lorber Export, Import
Marshall Co., C. & E.
Modern Tech. Supply
Morris Co., J. L.
Newall Mfg. Co.
New Jersey Jewelers' Sup.
Rivett Lathe & Grinder
Sandvik Saw & Tool
Sickles Sons, Inc., M.
Waples, W. S.
Zenith Mfg. & Chem. Corp.

WATER ANALYSIS OUTFITS, Including Hardness Testers

Barnstead Still & Ster. Co.
Beckman Instruments
Bogue Electric
Burrell Corp.
G. M. Mfg. Co.
Hagan Corp.
Hallikainen Inst.
Hellige, Inc.
Howe & French, Inc.
Industrial Instrs. Inc.
La Motte Chem. Prods.
Palo Lab. Supplies
Phipps & Bird
Precision Scientific
Scientific Glass App.
Taylor & Co., W. A.
Wallace & Tiernan

WATER and SEDIMENT APPARATUS

Automatic Steam Products
B-I-F Industries
Barnstead Still & Ster. Co.
Bogue Electric
Central Scientific
Davis Reg. Co.
G. M. Mfg. Co.
Henry Valve
Infilco Inc.
Instruments Corp.
Kontes Glass
Labline, Inc.
Owens-Illinois
McAlear Mfg. Co.
Precision Scientific
R. K. L. Valve & Mfg. Co.
Weston Electl. Instr.

WATER BATHS, Constant Temperature, see Baths, also Laboratory Apparatus, also Temperature Calibration

WATER METERS, see Flowmeters, Positive Displacement.

WATER METER TESTERS, see Flow Calibrators

WATER WORKS INSTRUMENTS (see also Waste Treatment Instruments)

B-I-F Industries
Barton Instr. Co.
Bristol Co.
Brooks Rotameter Co.
Builders-Providence
Consolidated Vacuum Corp.
Fischer & Porter Co.
Foxboro Co.
Hagan Corp.
Kates Co., W. A.
King Engrg. Corp.
Leupold & Stevens
Manning, Maxwell & Moore
Meriam Inst. Co.
Minneapolis-Honeywell
  Indust. Div.
Mason-Neilan Div.
New Jersey Meter Co.
Penn. Insts. Div.
Simplex Valve & Meter
Sparling Meter Co.
Taller & Cooper
Trimount Instr. Co.
Uehling Instr. Co.
Wallace & Tiernan
Warrick Co.

WATTHOUR METERS

Associated Research
Duncan Electric
Electron Radar Prod.
Ferranti Electric
Foxboro Co.
GE, Apparatus Sales
Landis & Gyr
Roller-Smith
Sangamo Electric
Simpson Electric
Sticht Co.
Veeder-Root
Westinghouse Electric

WATTHOUR METER TESTERS

Davenport Mfg. Co.
Ducan Elec. Mfg.
Eastern Spec. Co.
Electron-Radar Prod.
GE, Apparatus Sales
GE, Instrument Dept.
Hathaway Instr. Co.
Kahn & Co.
Knopp Inc.
Multi-Amp. Corp.
Rockwell Engrg. Co.
Sangamo Electric
Sorsensen & Co.
States Co.
Westinghouse Electric

WATTMETERS, Clamp Type

GE Apparatus Sales
Martindale Electric
Weston Electcl. Instr.

WATTMETERS, Electrostatic

GE
Hickok Elec. Instruments
Sensitive Research Instr.

WATTMETERS, Indicating

Autocall Co.
Bristol Co.
Electronic Instr. Co.
Fluke Mfg. Co.
GE, Apparatus Sales
GE, Instrument Dept.
Hickok Electcl. Instr.
Industrial Test
Landis & Gyr
Niagara Elect. Instr.
Norton Electcl. Instr.
Physics Research
Precision Scientific
Radiation Inc.
Rawson Electcl. Instr.
Roller-Smith Co.
Sensitive Res. Instr.
Servonic Instruments
Simpson Electric
Sticht Co.
Triplett Elect. Instr. Co.
United Electric
United Optical Mfg.
Welch Mfg. Co., W. M.
Westinghouse Electric
Weston Electcl. Instr.

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WATTMETERS, Laboratory Standard

Bird Electronic
Cambridge Inst. Co.
Central Scientific
Computer Co. of Amer.
Electrical Facilities Inc.
GE, Apparatus Sales
GE, Instrument Div.
Hickok Electcl. Instr. Co.
Physics Research
Rawson Electcl. Instr.
Roller-Smith Inst.
Sensitive Res. Instr.
Triplett Electr. Instr.
United Optical Mfg.
Welch Mfg. Co., W. M.
Weston Electcl. Instr.

WATTMETERS, Microwave

Amerac, Inc.
Bird Electronic
Brunswick Instruments
Chemalloy Electronics
Computer Co. of America
DeMornay-Bonardi, Inc.
Electron-Radar Prods.
G. W. Associates
Hewlett-Packard
Hycon Mfg. Co.
Jackson Co., Byron
Kearfott Co.
Marconi Instruments
Narda Corp.
New London Instr. Co.
Polytechnic Res. & Dev. Co.
Radiation, Inc.
RCA
Roller-Smith
Rollin C.
Sierra Electronic Corp.
Sperry Gyroscope Co.
WacLine, Inc.
Weinschel Engrg. Co.

WATTMETERS, Reactive

Bristol Co.
Esterline-Angus
GE, Apparatus Sales
GE, Instrument Dept.
Physics Research
Landis & Gyr
Physics Research
Roller-Smith
United Optical Mfg.
Westinghouse Electric

WATTMETERS, Recording

Bristol Co.
Esterline-Angus
GE, Apparatus Sales
GE, Instrument Dept.
Hathaway Instr. Co.
Hickok Electcl. Instr.
Roller-Smith
Sensitive Research Instr.
Sticht Co.
Westinghouse Electric

WAVEGUIDES, see Microwave

WAVE METERS, see Frequency Indicators

WAX MELTING APPARATUS

Central Scientific
Devtronics, Inc.
Fisher Scientific
Hacker & Co., W. J.
Hycon Mfg. Co.
Indust. Engrg. Corp.
Koehler Instr. Co.
Mason Instr. Co.
Parks-Cramer Co.
Precision Scientific
R. K. L. Valve & Mfg. Co.
Robinson Co., E. E.
Weston Electcl. Instr.

WAXES

Bakelite Div.
Bethlehem Apparatus Co.
Carbon & Carbide Chem.
Du Pont
Durez Plastics
Huisking & Co.
Mitchell Rand Insulating
Nye, Inc., William F.
Sherwin-Williams Co.
Teichert Engrg. Co.
Zophar Mills, Inc.

WEATHERING TESTERS, see Environmental Test Chambers, also Fading Testers

WEATHERING MACHINES

Amer. Paulin System
Atlas Electric Devices
G.M. Mfg. Co.
Thermometer Corp.

WEIGHING BOTTLES

Ace Glass
Exact Weight Scale Co.
Fisher Scientific
Kontes Glass
Owens-Illinois

WEIGHING SCALES, Basic Weight

Amthor Testing Instr. Co.
Baldwin-Lima-Hamilton
Becker Div., Christian
Buffalo Scale
Cady & Co., E. J.
Chatillon & Sons
Detecto Scales, Inc.
Dillon & Co., W. C.
Exact Weight Scale
Fairbanks, Morse & Co.
Gilmore Industries
Gurley, W. & L. E.
Hadley Assocs.
Howe Scale
Kent Cliff Labs. Div.
Link Engrg. Co.
Ohaus Scale
Pneumatic Scale
Richardson Scale
Seederer-Kohlbusch
Streeter-Amet
Testing Machines, Inc.
Thayer Scale & Engrg.
Thwing-Albert
Toledo Scale
Triner Sales Co.
Troemner Co., Henry

WEIGHING SCALES, Beam

Amer. Balance
Buffalo Scale
Detecto Scales
Exact Weight Scale
Fairbanks, Morse & Co.
Howe Scale
Jacobs Bros Co., Inc.
Kent Cliff Labs. Div.
Ohaus Scale
Pacific Scientific
Photoswitch, Inc.
Pneumatic Scale
Revere Copper & Brass
Seedburo Equipt.
Seederer-Kohlbusch
Testing Machines, Inc.
Thayer Scale & Engrg.
Troemner Co., Henry
Welch Mfg. Co., W. M.

WEIGHING SCALES, Conveyor

B-I-F Industries
Baldwin-Lima-Hamilton
Bell Automation Corp.
Builders-Providence
Chatillon & Sons
Detecto Scales
Dillion & Co., W. C.
Exact Weight Scale
Fairbanks, Morse & Co.
Gilmore Industries
Hadley Assocs.
Howe Scale
Industrial Electronics
International Bus. Mach.
Martin-Decker Corp.
Merrick Scale Mfg. Co.
Monsell, J.R.
Omega Machine
Revere Copper & Brass
Richardson Scale
Schaffer Poidometer Co.
Streeter-Amet
Thayer Scale & Engrg.
Toledo Scale
Trans-Weigh
Wallace & Tiernan
Weighing Components

WEIGHING SCALES, Counting

Amthor Testing Inst. Co.
B-I-F Industries
Buffalo Scale
Chatillon & Sons
Detecto Scales
Exact Weight Scale
Fairbanks, Morse & Co.
Hadley Assocs.
Howe Scale
Industrial Electronics
International Bus. Mach.
Jacobs Bros. Co., Inc.
Kent Cliff Labs. Div.
Metrogram Corp.
Monsell, J. R.
Ohaus Scale
Potter Instr. Co.
Seederer-Kohlbusch
Thayer Scale & Engrg.
Toledo Scale
Torsion Balance
Triner Scale & Mfg.

WEIGHING SCALES, Crane

Baldwin-Lima-Hamilton
Buffalo Scale
Chatillon & Sons
Detecto Scales
Dillon & Co., W. C.
Emery Co., A. H.
Fairbanks, Morse & Co.
Gilmore Industries
Howe Scale Co.
Hydroway Scales
Martin-Decker Corp.
Streeter-Amet
Toledo Scale

WEIGHING SCALES, Differential

Baldwin-Lima-Hamilton
Detecto Scales,
Exact Weight Scale
Fairbanks, Morse & Co.
Howe Scale
Jacobs Bros. Co., Inc.
Kent Cliff Labs. Div.
Metrogram Corp.
Monsell, J. R.
Taller & Cooper
Testing Machines Inc.
Thayer Scale & Engrg.
Thwing-Albert

WEIGHING SCALES, Dynamometer

Autom. Temp. Control
Central Scientific Co.
Chatillon & Sons
Conoflow Corp.
Detecto Scales
Dillon & Co., W. C.
Emery Co., A. H.
Exact Weight Scale
Fairbanks, Morse & Co.
Gilmore Industries
Hagan Corp.
Howe Scale
Link Engrg. Co.,
Martin-Decker Corp.
Maymer Corp.
Monsell, J. R.
Republic Flow Meters
Ruge Assocs.
Seederer-Kohlbusch
Stoelting Co., C. N.
Taller & Cooper
Testing Machines, Inc.
Toledo Scale
Welch Mfg. Co., W. M.

WEIGHING SCALES, Hopper

B-I-F Industries
Baldwin-Lima-Hamilton
Buffalo Scale Co.
Detecto Scales
Exact Weight Scale
Fairbanks, Morse & Co.
Gilmore Industries
Hadley Assocs.
Howe Scale
Industrial Electronics
Jacobs Bros. Co.
Monsell, J. R.
Revere Copper & Brass
Richardson Scale Co.
Ruge Assocs.
Seedburo Equipment
Streeter-Amet
Taller & Cooper
Thayer Scale & Engrg.
Toledo Scale
Weighing Components

WEIGHING SCALES, Laboratory

Ace Glass Co.
Amer. Balance
Becker Div., Christian
Buffalo Scale
Central Scientific
Chicago Apparatus Co.
Detecto Scales
Dietert Co.
Eberbach Corp.
Exact Weight Scale
Fairbanks, Morse & Co.
Fisher Scientific
General Biological
Goetze Niemer Co.
Hadley Assocs.
Heusser Instr. Mfg. Co.
Howe Scale
Humboldt Mfg. Co.
International Bus. Mach.
Jacobs Bros. Co., Inc.
Kent Cliff Labs Div.
Metrogram Corp.
Microchemical Service
Ohaus Scale Corp.
Refinery Supply Co.
Roller-Smith Corp.
Seedburo Equipment
Seederer-Kohlbusch
Sklar Des. Dev. Labs.
Standard Science Supply
Taller & Cooper
Testing Machines, Inc.
Thompson Balance
Toledo Scale
Torsion Balance
Troemner Co., Henry
Voland & Sons
Welch Mfg. Co., W. M.

WEIGHING SCALES, Platform

Baldwin-Lima-Hamilton
Becker Div., Christian
Buffalo Scale
Chatillon & Sons
Detecto Scales
Eckman Load Ind.
Exact Weight Scale
Fairbanks, Morse & Co.
Hadley Assocs.
Howe Scale
Humboldt Mfg. Co.
International Bus. Mach.
Monsell, J. R.
Revere Corp. of Amer.
Ruge Assocs.
Seedburo Equipment
Streeter-Amet
Taller & Cooper
Testing Machines, Inc.
Toledo Scale
Triner Scale & Mfg.
Weighing Components

WEIGHING SCALES, Portable

Black & Decker
Buffalo Scale
Central Scientific
Detecto Scales
Dillon & Co., W. C.
Emery Co., A. H.
Exact Weight Scale
Fairbanks, Morse & Co.
Howe Scale
Hunter Spring Co.
International Bus. Mach.
Jacobs Bros. Co., Inc.
Martin-Decker Corp.
Pelouze Mfg. Co.
Revere Copper & Brass
Revere Corp. of Amer.
Richardson Scale
Seedburo Equipment
Seederer-Kohlbusch
Streeter-Amet
Taller & Cooper
Testing Machines, Inc.
Toledo Scale
Torsion Balance
Triner Scales & Mfg.
Troemner Co., Henry
Voland & Sons
Welch Mfg. Co., W. M.

WEIGHING SCALES, Predetermined Weight

Automatic Scale
Avion Div.
Bell Automation Corp.
Buffalo Scale
Detecto Scales
Exact Weight Scale
Fairbanks, Morse & Co.
Hadley Assocs.
Howe Scale
Indust. Electronic Engrs.
Industrial Electronics
International Bus. Mach.
Jacobs Bros. Co., Inc.
Kent Cliff Labs. Div.
Merrick Scale Mfg. Co.
Metrogram Corp.
Monsell, J. R.
Pneumatic Scale Corp.
Revere Copper & Brass
Richardson Scale
Schaffer Poidometer Co.
Seederer-Kohlbusch
Streeter-Amet
Taller & Cooper
Thayer Scale & Engrg.
Toledo Scale
Torsion Balance
Triner Scales & Mfg.
Wallace & Tiernan
Weighing Components

WEIGHING SCALES, Recording and/or Remot Indicating, including Printout

Allegany Instr. Co.
Autom. Scale
Autom. Temp. Control
Avion Div.
B-I-F Industries
Baldwin-Lima-Hamilton
Becker Div., Christian
Bell Automation Corp.
Buffalo Scale
Builders-Providence
Chatillon & Sons
Conoflow Corp.
Daytronic Corp.
Detecto Scales
Eckman Load Ind.
Emery Co., A. H.
Exact Weight Scale
Fairbanks, Morse & Co.
Fielden Research
Gerber Scientific
Gilmore Industries
Hadley Assocs.
Hagan Corp.
Howe Scale
Indust. Electronic Engrs.
Industrial Electronics
International Bus. Mach.
Jacobs Bros. Co., Inc.
Jeffrey Mfg. Co.
Martin-Decker Corp.
Merrick Scale Mfg. Co.
Minnesota Electronics
Moister Register Co.
Monsell, J. R.
Omega Machine
Phoenix Prec. Instr. Co.
Republic Flow Meters
Revere Copper & Brass
Revere Corp. of Amer.
Richardson Scale
Rockwell Engrg.
Ruge-de Forest, Inc.
Schaffer Poidometer Co.
Seedburo Equipment
Streeter-Amet
Taller & Cooper
Thayer Scale & Engrg.
Toledo Scale
Torsion Balance
Trans-Weigh Co.
Triangle Package Mach.
Triner Scale & Mfg.
Troemner, Henry
Virginia Electronics
Wallace & Tiernan
Weighing Components

WEIGHING SCALES, Rolling Mill

Askania Reg. Co.
Autom. Temp. Control
Avion Div.
Baldwin-Lima-Hamilton
Bin-Dicator
Bristol Co.
Buffalo Scale
Builders-Providence
Cleveland Fuel
Daytronic Corp.
Detecto Scales
Electronic Prods. Co.
Fairbanks, Morse & Co.
Fielden Instr. Div.
Fuller Co.
Gaydon Co.
General Controls
Gilmore Industries
Howe Scale
Industrial Elect. Controls
Indust. Electronic Engrs.
Instruments Inc.
Jarco Services
Jeffrey Mfg. Co.
Lumenite Electronic Co.
Merrick Scale
Mosher Electronic
Nuclear Research Corp.
Ohmart Corp.
R-C Scientific Inst. Co.
Richardson Scale
Robinette Co., W. C.
Shallcross Controls
Synchro-Start Products
Techniflex Corp.

United Engineers
Viking Instruments
Worner Electronic Devices

WEIGHT CONTROLLERS, Bulk Material

Avion Div.
B-I-F Industries
Buffalo Scale
Daytronic Corp.
Detecto Scales
Exact Weight Scale
Gilmore Industries
Indust. Electronic Engrs.
Isotope Products, Inc.
Photobell Co.
R.K.L. Valve & Mfg. Co.
Revere Corp. of Amer.
Thayer Scale & Engrg.
Weighing Components

WEIGHT INDICATORS, Automatic Recording

Avion Div.
B-I-F Industries
Baldwin-Lima-Hamilton
Bell Automation Corp.
Bristol Co.
Buffalo Scale
Builders-Providence
Cameron Iron Works
Chatillon & Sons
Curtiss-Wright
Daytronic Corp.
Detecto Scales
Dillon & Co., W. C.
Eckman Load Ind.
Electrical Dev.
Exact Weight Scale
Fairbanks, Morse & Co.
Gilmore Industries
Howe Scale
Indust. Electronic Engrs.
Isotope Products, Inc.
Leeds & Northrup
Martin-Decker Corp.
Merrick Scale Mfg. Co.
Nuclear Research Corp.
Phoenix Prec. Inst. Co.
Polyphase Instr. Co.
Revere Corp. of Amer.
Robertshaw-Fulton Co.
Roller-Smith
Streeter-Amet
Taller & Cooper
Thayer Scale & Engrg.
Toledo Scale
Virginia Electronics
Wallace & Tiernan
Weighing Components
Wiancko Engrg. Co.

WEIGHTS, Analytical

Ace Glass
Ainsworth & Sons
Aloe Co., A. S.
Amer. Balance
Becker Div., Christian
Central Scientific
Detecto Scales
Dietert Co.
Exact Weight Scale
Fisher Scientific
Gurley, W. & L. E.
Hadley Assocs.
Howe Scale
Kent Cliff Labs. Div.
Ohaus Scale
Roller Smith
Schaar & Co.
Seedburo Equipment
Seederer-Kohlbusch
Standard Science Supply
Taller & Cooper
Testing Machines, Inc.
Thompson Balance
Torsion Balance Co.
Troemner Co., Henry
Voland & Sons, Inc.

WEIGHTS, Avoirdupois, Metric or Troy

Ace Glass
Ainsworth & Sons
Amer. Balance
Becker Div., Christian
Brinkmann Instruments
Burke & James
Central Scientific Co.
Chicago Apparatus Co.
Detecto Scales
Exact Weight Scale
Gaertner Scientific
Gurley, W. & L. E.
Hadley Assocs.
Howe Scale
Humboldt Mfg. Co.
Kent Cliff Labs. Div.
Metrogram Corp.
Ohaus Scale Corp.
Seederer-Kohlbusch
Standard Science Supply
Suter, Alfred
Thompson Balance
Toledo Scale
Torsion Balance Co.
Troemner Co., Henry
Voland & Sons, Inc.

WEIGHTS, Test, see Weights, Avoirdupois, Metric or Troy

WEIGHTS & MEASURES, Precision Standard

Amer. Balance
Burrell Corp.
Detecto Scales
Gurley, W. & L. E.
Hadley Assocs.
Jacobs Bros. Co.
Kent Cliff Labs. Div.
Ohaus Scale
Pfaltz & Bauer, Inc.
Seederer-Kohlbusch
Seraphin Test Measure
Thompson Balance Co.
Torsion Balance Co.
Troemner, Henry
Voland & Sons
Webber Gage Co.

WEIR METERS, see Flowmeters, Open Channel

WELDERS, Automatic

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Ewald Instruments
Federal Tool Engrg Co.
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Mann Co., Wm. I.
Peer, Inc.
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Sheffield Corp.
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Westinghouse Electric

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Bastian Blessing
Booth Co., Arthur E.
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Cutler-Hammer
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GE, Apparatus Sales
Grove Valve & Regu. Co.
Hoke, Inc.
Industrial Timer
Kahle Engrg. Co.
Linde Air Prods.
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Mullenbach Div.
National Time & Signal
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Peer, Inc.
Polyphase Instr. Co.
Photovolt Corp.
Raytheon Mfg. Co.
Robotron Corp.
Square D Co.
Stewart Instr. Co.
Taylor-Winfield Corp.
Timetrol Co.
Vacuum Tube Prods.
Wilson & Co., G. C.
Worthington Corp.

WELDING EQUIPMENT, Oxyacetylene

Bastian-Blessing
Grammes & Sons
National Cylinder Gas

WELDING EQUIPMENT, Spot

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Ewald Instruments
Federal Mach. & Welder
Federal Tool Engrg. Co.
Fusion Engrg. Co.
Grammes & Sons, Inc.
Kahle Engrg. Co.
National Cylinder Gas
Peer, Inc.
Raytheon Mfg. Co.
Taylor-Winfield Corp.
Unitek Corp.
Vacuum Tube Prods. Co.
Weldmatic Div.
Westinghouse Electric

WELDING EQUIPMENT, Stored-Energy

Ewald Instruments
Federal Tool Engrg. Co.
Kahle Engrg. Co.
Raytheon Mfg. Co.
Taylor-Winfield Corp.
Unitek Corp.
Vacuum Tube Prods. Co.
Weldmatic Div.

WELLS, Thermocouple or Thermometer, see Thermowells

WHEELS, Sapphire, Grinding & Burnishing

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Elgin National Watch
Engis Equipment
Fish-Schurman
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Jadow Inc., B.
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Leeds & Northrup
Mann Co., W. I.
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North American Instr.
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Statham Labs.
Stratex Instr. Co.
Taylor Instr. Cos.
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Magnet Wire Div.
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North Amer. Philips Co.
Precision Tube Co.
Reynolds Metals Co.
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Uniform Tubes

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Sylvania Elct. Prod.
Wilson Co., H. A.

WIRE, Copper, Enameled

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Cohn Corp., Sigmund
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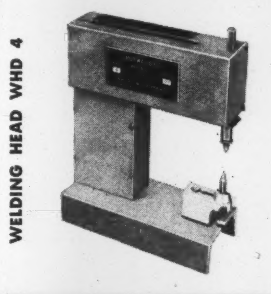

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Tensolite Insul. Wire Co.
Warren Wire Co.

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Sylvania Elect. Prods.

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Rex Corp.
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Warren Wire Co.
Watertown Mfg. Co.
Wheeler Insul. Wire, Inc.
Whitney Blake Co.

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Hamilton Watch
Universal-Cyclops
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WIRE, Kovar

Driver-Harris Co.
Stupakoff Div.
Sylvania Elect. Prods.
Universal-Cyclops

WIRE, Laminated

General Plate Div.
Kellogg Switchbd. & Sup.
Secon Metal Corp.
Wilson Co., H. A.

WIRE, Magnet

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Allegheny Ludlum Steel
American Brass Co.
Anaconda Wire & Cable
Belden Mfg. Co.
Birnbach Radio Co.
Chase Brass & Copper
Crescent Insd. Wir. & Cbl.
Consolidated Wire
Crucible Steel Co. of Am.
Electric Auto-Lite Co.
GE
General Winding Co.
Hitemp Wires, Inc.
Magnet Wire Div.
Nesor Alloy Prod.
North Amer. Philips Co.
Rea Magnet Wire Co.
Roebling's Sons Co.
Rome Cable Co.
Sprague Electric Co.
Sylvania Elect. Prods.
Tensolite Insul. Wire Co.
Warren Wire Co.
Wheeler Insul. Wire, Inc.

WIRE, Metal Shielded

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Anaconda Wire & Cable
Birnbach Radio Co.
Breeze Corps.
Chester Cable Corp.
Cornish Wire Co.
Crescent Insd. Wir. & Cbl.
Elect. Auto-Lite Co.
GE
Hitemp Wires, Inc.
Koiled Kords, Inc.
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Lewis Engrg. Co.
Magnet Wire Div.
Microdot, Inc.
Precision Tube Co.
Roebling's Sons Co.
Sequoia Wire
Surprenant Mfg. Co.
Uniform Tubes, Inc.
Warren Wire Co.
Whitney Blake Co.
Wilson Co., H. A.

WIRE, Miscellaneous, including Bismuth, Columbium, Hastelloy, Illium, Molybdenum, Tantalum

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Cerro de Pasco Corp.
Cleveland Tungsten
Crucible Steel Co. of Amer.
Division Lead Co.
Driver Co., Wilbur B.
Easton Mfg. Co.
Fansteel Metallurgical
Fitzpatrick Electric Supply Co.
GE, Lamp Wire Dept.
Haynes Stellite Co.
Kemet Div.
Mallory & Co., P. R.
Nesor Alloy Prod.
North Amer. Philips
Sylvania Elec. Prod., Inc.
Westinghouse Electric

WIRE, Music, see Wire, Spring

WIRE, Nickel, Monel and Nickel Chromium

Amer. Chain & Cable
Cohn Corp., Sigmund
Consolidated Wire
Crucible Steel of Amer.
Driver Co., Wilbur B.
Driver-Harris Co.
Eaton Mfg., Rel. Div.
General Alloy Co., Inc.
General Plate Co.
Hamilton Watch
Haynes Stellite Co.
Hoskins Mfg. Co.
Jelliff Mfg. Corp., C. O.
Jessop Steel Co.
Kanthal Corp.
Metals Goods Corp.
Michigan Steel Casting
North Amer. Phillips Co.
Sylvania Elec. Prod., Inc.
Universal-Cyclops

WIRE, Refractory Insulated

Aero Research Instr. Co.
American Wire Div.
Harco Laboratories
Roebling's Sons Co.
Stupakoff Ceramic & Mfg.

WIRE, Resistance (Platinum or Platinum-Iridium)

Amer. Electro-Metal
Amer. Platinum Works
Baker & Co.
Bishop & Co., J.
Cohn Corp., Sigmund
General Plate Div.
Gordon Co., Claud S.
Mallory & Co., P. R.
Nesor Alloy Prod.
Ney Co., J. M.
Secon Metal Corp.
Sylvania Elect. Prods.
Thwing-Albert
Wilson Co., H. A.

WIRE, Resistance, except Platinum and Platinum-Iridium

Allegheny Ludlum Steel
Baker & Co., Inc.
Bishop Platinum Works
Carpenter Steel Co.
Cohn Corp., Sigmund
Consolidated Wire
Crucible Steel of Amer.
Driver Co., Wilbur B.
Driver-Harris Co.
General Plate Co.
General Winding Co.
Hoskins Mfg. Co.
Jelliff Mfg. Co., C. O.
Kanthal Corp.
Lewis Engrg. Co.
Nesor Alloy Prod.
Ney Co., J. M.
North Amer. Philips Co.
Precision Resistor Co.
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Roebling's Sons Co.
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Universal-Cyclops

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Amer. Nickeloid Co.
Amer. Steel & Wire
Crucible Steel Co. of Am.
Driver Co., Wilbur B.
Driver-Harris Co.
Eaton Mfg. Co.
Hoskins Mfg. Co.
Jelliff Mfg. Corp.
Page Steel & Wire Div.
Secon Metals Corp.
Sylvania Elect. Prods.

WIRE, Round Edge, Flat, Phosphor Bronze

Allied Prods. Div.
Amer. Brass Co.
Bridgeport Brass Co.
Driver Co., Wilbur B.
Eaton Mfg., Rel. Div.
North Amer. Philips Co.
Pecision Prods. Co.
Roebling's Sons Co.
Scovill Mfg. Co.
Secon Metals Corp.
Sylvania Elect. Prods.

WIRE, Sheared and Special Rolled

Allied Prods. Div.
Amer. Chain & Cable
Precision Products Co.
Roebling's Sons Co.
Secon Metals Corp.

WIRE, Spring

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Allied Prods. Div.
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Amer. Chain & Cable
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Beryllium Corp.
Bridgeport Brass Co.
Chase Brass & Copper
Crucible Steel of Amer.
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Driver-Harris Co.
Eaton Mfg., Rel Div.
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Gallien, R. P.
Halcomb Steel Co.
Instr. Specialties Co.
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Modern Technical
Page Steel & Wire Div.
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Universal-Cyclops
Watch-Motor Mainspring
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WIRE, Stainless Steel, see Wire, Spring

WIRE, Swedish Music, see Wire, Spring

WIRE, Thermocouple, Base Metal

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Amer. Chain & Cable
Assembly Products
Baker & Co., Inc.
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WIRE, Thermocouple, Rare Metal

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Bristol Co.
Cohn Corp., Sigmund
Foxboro Co.
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Gordon Co., Claud S.
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Minneapolis-Honeywell Indust. Div.
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Richards Co., Arklay S.
Secon Metal Corp.
Tensolite Insul. Wire Co.
Thermo-Electric Co.
Thwing-Albert
Uniform Tubes
West Instr. Corp.
Wilson Co., A. H.
Winslow Co.

WIRE, Thermocouple, Special, High emf

Aero Research Instr. Co.
Amer. Platinum Works
Baker & Co., Inc.
Bishop Platinum Works
Bristol Co.
Cohn Corp., Sigmund
Driver Co., Wilbur B.
GE, Apparatus Sales
Gordon Co., Claud S.
Harco Labs.
Lewis Engrg. Co.
Pyrometer Instr. Co.
Richards Co., Arklay S.
Secon Metal Corp.
Tensolite Insul. Wire Co.
Thermo-Electric Co.
Uniform Tubes
Winslow Co., Inc.

WIRE, Tungsten

Cleveland Tungsten, Inc.
Fansteel Metallurgical
GE, Lamp Wire Dept.
Mallory & Co., P. R.
Nesor Alloy Prods.
North Amer. Philips
Sylvania Elect. Prods.
Westinghouse Electric
Wilson Co., H. A.

WIRE, Wollaston (For Cross Wires)

Amer. Platinum Works
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Bishop & Co., J.
Cohn Corp., Sigmund
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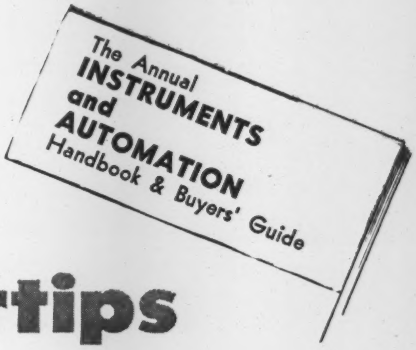

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Lynn, Robert M.
Richmont, Inc.
Skyway Precision
Sturtevant Co., P. A.

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Baird Assocs.-Atomic
Balteau X-Ray Dept.
Central Research Labs.
Distillation Products
Farrand Optical Co.
GE, X-Ray Dept.
Hayes Scientific App.
Hulcher Co., Charles
Jarrell-Ash Co.
Mitchell Radiation Prod.
North Amer. Philips Co.
Picker X-Ray
RCA Div.
Summers Gyroscope
Wyland, G. C.

X-RAY EQUIPMENT (See also Flaw Detection)

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Allis-Chalmers
Aloe Co., A. S.
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X-RAY INTENSIFYING SCREENS, see Screens X-ray Intensifying

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Douglas Radio Labs.
El-Tronics, Inc.
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Georator Corp.
Jordan Electronic Mfg. Co.
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Marconi Instruments Ltd.
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Radiation Counter Labs.
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Instrument Dev. Labs.
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X-RAY SPECTROGRAPHS, see Spectrographs, X-Ray

X-RAY SPECTROMETERS, see Spectrometers, X-Ray

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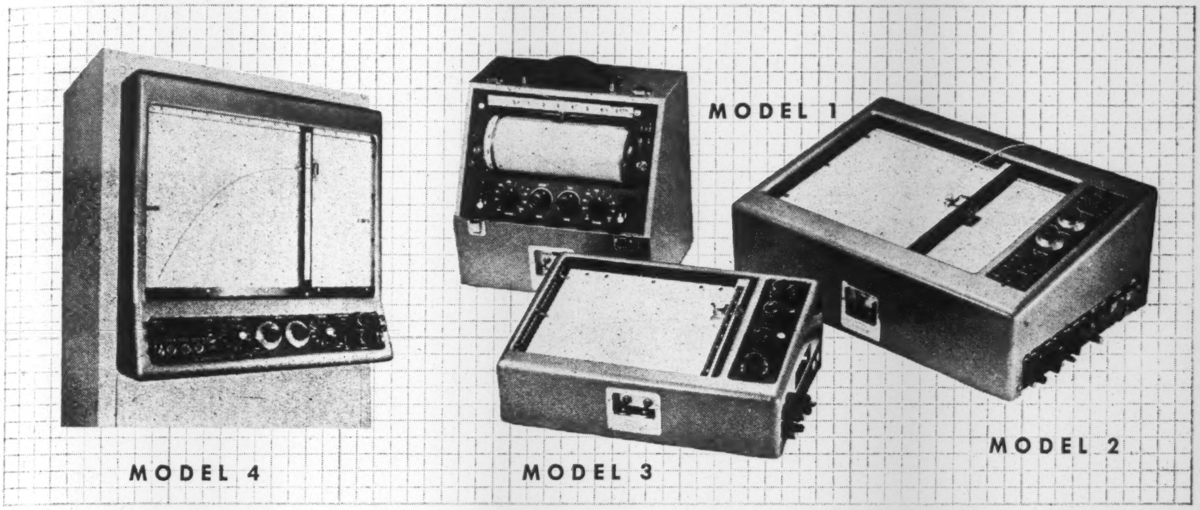

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8½"x11" paper
X-Y Recorder-
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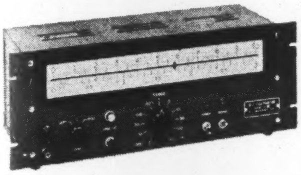
MODEL 4
Rack Type
11"x16½" paper
X-Y Recorder-
Curve Follower-
Point Plotter

MOSELEY ACCESSORY PRODUCTS



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Converts information from punched cards or perforated tape for automatic plotting.

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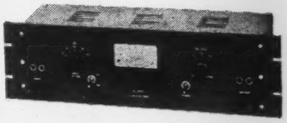
For plotting large amounts of tabular data in point-curve form. Self-contained voltage source with full three column keyboard in both axes.



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J-B-T

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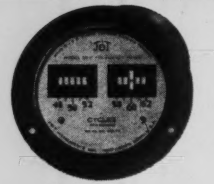
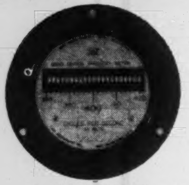
SWITCHES, Instrument and Test Equipment Quality: ROTARY, LEVER, TOGGLE
for THE ELECTRONIC INDUSTRY

J-B-T

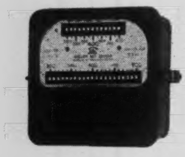


Model 30-F
Dual Range, Double Window



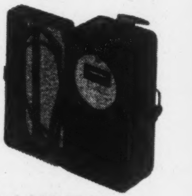
Model 36-FX-21
21-Reed Meter in 3½" Case

Model 34-FHXX
9-Reed in 3½" Sealed Case



Model 41-FX
Dual Range in 4" Case

Model 15-FHAC
2-Reed in 1½" Sealed Case



Model 33-FP-9M
Portable, Metal Case
TS-328 A/U (400 cy. type) Shown

VIBRATING REED FREQUENCY METERS

Meters illustrated are typical panel mounting or portable—for use where constant or known frequency is important to efficient operation of equipment.

- *Permanently Accurate* within ±0.3% or better at reference temperature, depending on the model. This accuracy is not affected by poor wave form, external magnetic disturbances, or voltage fluctuations.
- *Size and Type for Every Service.* Made in a wide variety of portable and panel case styles, reed groupings and frequency ranges from 12 to 650 cycles and above; 100-130 volts furnished unless otherwise specified.
- *Rugged Construction* of simplified, patented design, with no moving parts to wear out or get out of calibration. Ideal for field and mobile applications.
- *Suitable for Electronic Circuits* because of relatively low power consumption and J-B-T reeds with high Q and sharp, immediate response.

3½" and 2½" SEALED Types

3½ inch FHXX Meters sealed, glass-to-metal construction with solder terminals, meet or exceed the sealing and electrical requirements of JAN-I-6 and MIL-M-6A including the 3000 volt breakdown, and use the front mounting dimensions specified. Max. barrel diameter, 2 11/16"; 2⅞" overall depth behind flange. While not regularly stocked, these meters are in volume production. New 2½" meters Model 21-FHXX available on special order.

1½" SEALED Types

Model 15-FHAC (illustrated above). 60 and 400 cycles, 2 reeds, 8-10 volts, for cathode follower circuit. Widely used on audio oscillators to standardize output. Meets intent JAN-I-6, MIL-M-6A and amendments on sealed meters. Barrel, 1½" diameter; detachable flange, 2.094" diameter; solder terminals.

Model 15-FH Series (not illustrated) — Same case, sealed, 5 reeds, 58-62 cycles, 100-130 volts, or 390-410 cycles, 100-130 volts. Variations such as 6 reeds or 25 cycles available on special order.

ASK FOR CATALOG 556

ELAPSED TIME METERS

For Maintenance, Tube Life Data, and Operating Time Records—on Motor Generators, Transmitters, Receivers, Rectifiers, Test Set-ups, etc.

Model 31-EX (illustrated) also known as running-time or total time meter, registers in 1/10 hours to 9,999.9 hours, then automatically resets. Normally stocked for 60 cycles, 110-130 volts. 3½" standard meter mounting. Variations such as 50 cycles; 230 volts; 0-99,999 hours; 3" rectangular case; and readings in minutes available on special order.

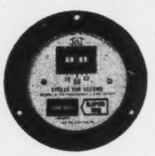
SEALED ELAPSED TIME METERS

Model 31-EHXX—Fully sealed meter, reading 0-9,999.9 hours, same as Model 31-EX above. Glass-to-metal construction, solder terminals, and 3½" detachable flange, all match XX metal frequency meter case. 1000 volt breakdown.

Model 33-EHXX — Operates on 400 cycles, 110-125 volts, to read 0-9,999.9 hours in 1/10 hour steps. It is presently made only in 3½" flange sealed metal case, 2¾" diameter, 4" deep behind panel. 1000 volt breakdown.

Model 21-EHXX—New. 2½" flange, sealed, full size counter.

FREQUENCY — TIME METERS



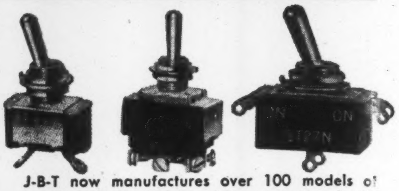
Combination Reed-Type Frequency — Elapsed Time Meters—One Meter Does the Work of Two.

Model 31-FE (illustrated) pioneered by J-B-T, saves panel space and cost, and encourages periodic maintenance; 3¼" flange, metal case, 4 19/32" overall depth, standard. 3½" case known as 31-FEX-1 supplied on custom orders. 5 reeds, 60 cycle range, standard; 7, 9, 11 reeds or 50 cycle range on special order.

DISTRIBUTOR SERVICE

Standard J-B-T items are available through authorized electronics parts distributors.

TOGGLE SWITCHES FOR JAN or MIL

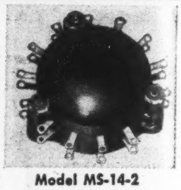


J-B-T now manufactures over 100 models o toggle switches, designed for exceptional reliability, as in JAN-S-23 and Ordnance Standard DDAX. Variations at additional cost are bein added for MIL-S-6745 specialized AN Air Forc Requirements and 4 series of MIL-S-3950 ar being added.

ST40, 42, 50, 52 series—Solid coin silver contacts and rocker arms, unique to J-B-T, ad overload protection and keep contact resistanc under .005 ohms. Nominal ratings 20 amp a 125 VAC, 10 amp, 250 VAC. See Bulletin TS-4A.

ST12, 13, 16, 17, 22, 23, 26, 27 series—Nominally rated 6 amp at 125 VAC, 3 amp, 25 VAC; threaded bushings 25/64" or ¼" long Current carrying parts heavily silver plated. See Bulletin TS-5A.

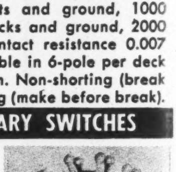
MOLDED ROTARY SWITCHES



Model MS-14-2

Shorting and Non-Shorting . . . 14 or 20 Positions . . . 1 to 6 Decks (more on special order) . . . All moving contacts enclosed — eliminates dirt and corrosion . . . sturdy construction with 3-post deck suspension, double-grip collector arms, and rectangular drive shaft through decks for precision indexing . . . test results available covering certain procedures of MIL-E-5272 A . . . interchangeable, electrically and mechanically with J-B-T Series SS-14 and 20 position Laminated Switches. Carrying capacity (not make-and-break): 1 amp.; maximum momentary, normal 5 amp.; maximum voltage between contacts and ground, 1000 volts R.M.S.; between decks and ground, 2000 volts R.M.S. Average contact resistance 0.007 ohms or less. Also available in 6-pole per deck double throw construction. Non-shorting (break before make) and shorting (make before break).

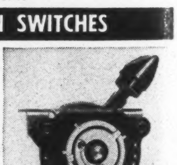
LAMINATED ROTARY SWITCHES



Model SS-14-2

Used widely in quality test equipment, portable instruments, inspection setups and avionics where trouble-free, dependable performance counts. Two basic types —14 pos. (2" dia.) or 20 pos. (2 23/32" dia.) give extra contacts in minimum space. One to six decks.

LEVER ACTION SWITCHES



Model SS-14-1L4-2

Same top-quality parts as in SS-14 series. Single deck types may be mounted in groups ¾" between centers; 2 deck types, 1 5/16" between centers. For new ganged-lever types, SSG series, in 3, 4 or 5 positions, 2 to 10 decks, see print SK-74.

ASK FOR CATALOG 556

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(See advertisement on page 30)

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Acro Products Co., 369 Shurs Lane, Roxborough, Philadelphia 28, Pa.
Transformers

Acromark Co., 3-11 Morrell St., Elizabeth 4, N. J.
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(See advertisement on page 145)

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Designing, testing and fabrication of aerodynamic sensing probes; complete temperature sensing systems; ceramic insulated thermocouple wire and conductors
(See advertisement on page 244)

Aerolite Electronics Corp., 507-26th St., Union City, N. J.
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Aeromarine Instrument Co., Inc., 385 Gerard Ave., New York 51, N.Y.
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Aircraft Electronics Associates, Inc., 94 Silas Deane Highway, Rocky Hill, Conn.
Aircraft instruments and testers

Aircraft-Marine Products, Inc., 2100 Paxton St., Harrisburg, Pa.
Repair kits; connectors
(See advertisement on page 47)

Aircraft Radio Corp., Boonton, N. J.
Aircraft radio equipment; test equipment

Aircraft Transformer Corp., Willow & West Sts., Long Branch, N. J.
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Airdesign Incorporated, 241 Fairchild Ave., Upper Darby, Pa.
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Alden Products Co., 117 N. Main St., Brockton 64, Mass.
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(See advertisement on page 80)

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Vibration fatigue testers

All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N. Y.

All Weather Springs, 56 Main St., Millburn, N. J.

Allard Instrument Corp., 146 E. 2nd St., Mineola, L. I., N. Y.
Aircraft instruments; power units; motors; switches; components

Allegany Instrument Co., 1091 Wills Mountain, Cumberland, Md.
Pressure recorders; amplifiers; cathode ray recorders; reflectometers; portable potentiometers

Allegheny Plastics, Inc., Route #51 & Thorn Run Rd., Coraopolis, Pa.
Printed and laminated plastic dials, nameplates, etc.

Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 22, Pa.
Stainless, tool and electrical steels, and alloys

Allen, Chas. I., Pequabuck, Conn.
Allen Co., Inc., L. B., 6710 Bryn Mawr Ave., Chicago 31, Ill.

Allen Co., A. K., 57 Meserole Ave., Brooklyn 22, N. Y.
Air and hydraulic cylinders; air valves and clamps; indexing feed tables

Allen Mfg. Co., 100 Sheldon St., Hartford 2, Conn.
Hex-socket cap and set screws

Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 4, Wisc.
Electric control apparatus; radio, television and electronic components

Alliance Mfg. Co., Lake Park Blvd., Alliance, Ohio
Fractional-hp motors

Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

Allied Control Co., Inc., 2 East End Ave., New York 21, N. Y.
Relays; switches; remote control equipment

Allied Engineering Div., Ferro Corp., 4150 East 56th St., Cleveland, Ohio

Allied Engraving & Stamping Co., 17-21 Elm St., Buffalo 3, N. Y.
Instrument panels

Allied Products Div., Hamilton Watch Co., 940 Wheatland Ave., Lancaster, Pa.

Allied Radio Corp., 100 N. Western Ave., Chicago, Ill.
Amplifiers and audio frequency equipment; electronic parts distributors

Allis-Chalmers Mfg. Co., P. O. Box 512, Milwaukee 1, Wisc.
Position indicators; frequency load and phase regulators

Alloy Bellows Engineering Co., 18125 Roseland Rd., Cleveland 12, Ohio
Temperature, pressure and vacuum controllers

Almo Mfg. Co., 113-119 Sussex Ave., Newark 3, N. J.
Mercury switches; vacuum and gas-filled lamps

Alpha Corp., 65 Harvard Ave., Stamford, Conn.
Instrument lubricating oils and oil testers

Alpha Metals, Inc., 56 Water St., Jersey City 4, N. J.
Solder; flux; anodes and leadwire

Alpha Molykote Corp., 65 Harvard Ave., Stamford, Conn.
Lubricants.
(See advertisement on page 135)

Altec Lansing Corp., 9356 Santa Monica Blvd., Beverly Hills, Calif.
Audio equipment

Alteneder & Sons, Theo., 1217 Spring Garden St., Philadelphia 23, Pa.
Drawing instruments
(See advertisement on page 222)

Alto Scientific Co., 855 Commercial St., Palo Alto, Calif.
Electrical test instruments

Amelco, Inc., 2040 Colorado Ave., Santa Monica, Calif.
Electronic research and development; electronic assembly fabrication; electronic test equipment; defense industry major sub-contractors

Amerac Incorporated, 116 Topsfield Rd., Wenham, Mass.
Electrical and electronic instruments

American Balance Corp., 48 Potter Ave., New Rochelle, N. Y.
Balances, scales and weights

American Brass Co., Waterbury 20, Conn.

American British Electric Corp., 57 Park Ave., New York 16, N. Y.
Voltage-dividing resistors

American Chain & Cable Co., Helicoid Gage Div., 929 Connecticut Ave., Bridgeport 2, Conn.
Bourdon tube gages and pressure indicators
(See advertisement on page 41)

American Chronoscope Corp., 316 W. First St., Mt. Vernon, N. Y.
Time study instruments; electronic test equipment

American Condenser Co., 4410 N. Ravenwood Ave., Chicago 40, Ill.
Capacitors

American Cystoscope Makers, Inc., 1241 Lafayette Ave., New York 59, N. Y.
Bore and internal surface inspection devices

American Electric Motors, Inc., 4811 Telegraph Rd., Los Angeles 22, Calif.

American Electroneering Corp., 2040 Colorado Ave., Santa Monica, Calif.
Electronic instruments

American Electronic Labs., Inc., 641 Arch St., Philadelphia 6, Pa.
Electrical and electronic instruments; photoelectric instruments; antenna design; radar test equipment

American Electronics, Inc., 655 W. Washington Blvd., Los Angeles 15, Calif.
Ac-dc miniature motors and blowers; motor alternators. induction couplings; servo components; magnetic recorders; nuclear instruments

American Elite, Inc., 7 Park Ave., New York 16, N. Y.
Antennas; connectors; cathode-ray and electron tubes; electronic components

American Emblem Co., Inc., P. O. Box 116, Utica 1, N. Y.
Contract manufacturers of bezels, nameplates and decorative trim

American Forest Products Co., 30 & Thompson Sts., Philadelphia 21, Pa.

American Gage & Machine, see Simpson Electric Div.

American Gas & Chemicals, Inc., 120 E. End Ave., New York 28, N. Y.
Leak detecting liquid

American Gas Accumulator Co., see A'G'A' Div. Elastic Stop Nut Corp.

American Gas Furnace Co., 988 Lafayette St., Elizabeth 4, N. J.
Gas fired furnaces and burners

American Gyro Corp., 3030 Nebraska Ave., Los Angeles 64, Calif.

American Hard Rubber Co., 93 Worth St., New York 13, N. Y.

American Hydromath Corp., 25-20 43rd Ave., Long Island City 1, N. Y.
Nautical instruments; quality control instruments; slide rules

American Indicator-Paper Co., 4611 N. Kostner Ave., Chicago 30, Ill.
Chemical indicator papers

American Industrial Instrument Co., 46 Florence St., Springfield 5, Mass.
Automatic assembly machines (custom)

American Instrument Co., 8010-8020 Georgia Ave., Silver Spring, Md.
Scientific instruments and materials testing apparatus

American Kloeckner-Moeller Corp., 4113 E. 11th St., Tulsa 12, Okla.
Industrial measuring and automatic-control instruments; control valves; relays; components

American Laubscher Corp., 250 West 57th St., Fisk Bldg., New York 19, N. Y.
Screw machine products; instrument jewels; hair springs; centerless ground and polished products; stampings and dies; pinions; gears; wheels; dials; panels; scales
(See advertisement on page 139)

American Lava Corp., Cherokee Blvd. & Manufacturers Rd., Chattanooga 5, Tenn.

American Lens Co., 45 Lispenard St., New York, N. Y.
Cathode-ray tubes and lenses

American Machine & Foundry Co., Electronics Div., 1085 Commonwealth Ave., Boston, Mass.
Electrical and electronic instruments and components; medical and biological instruments

American Machine & Metals Inc.
(See U. S. Gauge)

American Measuring Instruments Corp., 21-25 4th Ave., Long Island City 1, N. Y.
Precision measuring instruments

American Mercantile Co., Inc., 33 W. 42nd St., New York 18, N. Y.

American Meter Co., 920 Payne Ave., Erie 6, Pa.
Positive displacement gas & air meters; pressure reducing regulators; meter testing apparatus; indicating, recording and integrating flowmeters; rate volume and liquid level controllers; remote controllers

American Name Plate & Mfg. Co., see Anco Instr. Div.

American Nickeloid Co., 57 2nd St., Peru, Illinois
Prefinished metal sheets, strips and coils.

American Optical Co., Instrument Div., Box A, Buffalo 15, N. Y. (Projectors Div., 80 Heard St., Chelsea, Mass.)
Scientific optical instruments; projection apparatus; testing equipment; microscopes, microtomes, refractometers, spectrometers, visual colorimeters, illuminators, delineascopes, magnifiers; special lenses, prisms and mirrors.

American Paulin System, 1524 So. Flower St., Los Angeles 15, Calif.
Meterological instruments; altimeters; barometers
(See advertisement on page 68)

American Perfit Crystal Corp., 653 Eleventh Ave., New York 36, N. Y.

American Photocopy Equipment Co., 1920 W. Peterson Ave., Chicago 26, Ill.
Photocopy equipment

American Platinum Works, 231 N. J. Railroad Ave., Newark, N. J.

American Rectifier Co., 93 Lafayette St., New York 13, N. Y.
Rectifiers; power supplies

American Recording Chart Co., 3113 E. 11th St., Los Angeles 23, Calif.

American Research Corp., 11 Brook St., Bristol, Conn.
Testers for environment conditions, product properties, etc; instrument calibrating

American Resin Corp., 3215 N. Sheffield Ave., Chicago 13, Ill.

American Silver Co., 36-07 Prince St., Flushing 54, N. Y.
Silver solders; solder flushed metals

American Television & Radio Co., 300 E. Fourth St., St. Paul 1, Minn.

American Temperature Indicating Co., 1017 Summit St., Toledo 4, Ohio
Electrical resistance thermometers

American Thermo-Electric Co., 7269 Santa Monica Blvd., Los Angeles 46, Calif.
Vacuum, separate-heater, and contact type thermocouples
(See advertisement on page 217)

American-Thermo Ware Co., 12-16 Warren St., New York 7, N. Y.

American Time Products, Inc., 580 Fifth Ave., New York 36, N. Y.
Timing systems; frequency standards
(See advertisement on page 46)

American Tradair Corp, 34-01 30 St., Long Island City 6, N. Y.
Electronic instruments and components; radioactivity counters, shields, etc.

Ameriine, 1753 N. Honore St., Chicago 22, Ill.
Radio tube testers; spark plug testers

Amersil Co., Inc., 685 Ramsey Ave., Hillside 5, N. J.
Fused silica and quartz products

Ames Co., B. C., 131 Lexington St., Waltham, Mass.
Comparator and dial gages; length measuring devices

Ames Precision Machine Works, 131 Lexington St., Waltham 54, Mass.
Instrument lathes; hardness testers

Amglo Corp., 2037 W. Division St., Chicago 22, Ill.
Gas discharge tubes for signals, controls, stroboscopic and photographic uses; dc timer motors and timers; electronic flash units; special electron tubes
(See advertisement on page 149)

Amperex Electronic Corp., 230 Duffy Ave., Hicksville, L. I., N. Y.
Electron tubes; X-ray tubes

Amperite Co., Inc., 561 Broadway, New York 12, N.Y.
Delay relays; ballast regulators
(See advertisement on page 187)

Ampex Corp., 934 Charter St., Redwood City, Calif.
Magnetic tape recorders

Amphenol Electronics Corp., 1830 S. 54th Ave., Chicago 50, Ill.
Electrical rack and panel connectors; Teflon and polyethylene Coaxial cable plugs and sockets; cable and wire assemblies
(See advertisement on page 34)

Amplifier Corp. of America, 398 Broadway, New York 13, N. Y.
Amplifiers; magnetic tape recorders

Amplitronix, Inc., 155 W. 72 St., New York 23, N. Y.

Amthor Testing Instrument Co., Inc., 45 Van Sinderen Ave., Brooklyn 7, N. Y.
Physical testing machines; speed indicators; indicating, recording, hand tachometers; thickness gages; mercury columns; scales: paper, cordage, foil
(See advertisement on page 131)

Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

Analogue Controls, Inc., 39 Roselle St., Mineola, L. I., N. Y.
Precision potentiometers

Analysis Sales Co., 1827 Union Commerce Bldg., Cleveland 14, Ohio
Impact recorders

Analytical Measurements, Inc., 585 Main St., Catham, N. J.
pH probes and meters

Anatran Engineering Corp., 165 E. California, Pasadena 2, Calif.
Electrical and electronic components

Anco Instr. Div., Amer. Name Plate & Mfg. Co., 4254 W. Arthington St., Chicago 24, Ill.
Electronic instruments; industrial stethoscopes

Anders Lykens Corp., Lykens, Pa.
Instrument air dryers

Andersen Laboratories, Inc., 39 Talcott Rd., W. Hartford 10, Conn.
Fixed and variable solid delay lines

Anderson, Arthur R., 110 Woodbury Ave., Springdale (Stamford), Conn.
Strain gages

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Balancing machines

Anderson Machine Shops, Inc., Brook Rd., Needham Heights 94, Mass.
Testing machines; yarn testers; computers

Anderson Co., V. D., 1935 W. 96th St., Cleveland 2, Ohio
Air cleaners, scrubbers and strainers. steam traps

Anderson & Sons, Inc., Westfield, Mass.

Andrew Technical Supply Co., 6972 N. Clark St., Chicago 26, Ill.
Laboratory apparatus

ANelex Corp., 150 Causeway St., Boston 14, Mass.
High-speed data printing systems

Anemostat Corp. of America, 10 E. 39th St., New York 16, N. Y.
Airspeed indicators; thermometers; static pressure indicators

Anetsberger Bros., Inc., Northbrook, Ill.
Temperature and humidity test chambers

Ann Arbor Instrument Works, 725 Packard St., Ann Arbor, Mich.
Testing machines

Ann Arbor Optical Co., P. O. Box 2056, Ann Arbor, Mich.
Optical test instruments

Annin Company, 6570 E. Telegraph Rd., Los Angeles 22, Calif.
Control valves
(See advertisement on page 39)

Annis Company, R. B., 1101 N. Delaware St., Indianapolis 2, Ind.
Precision dynamic and single plane balancing machines; magnetizing and demagnetizing equipment; split core current transformers
(See advertisement on page 140)

Anti-Corrosive Metal Products Co., Inc., S. River St., Castleton-on-Hudson, N. Y.
Stainless steel and nylon fastenings

Anton Electronic Labs., Inc., 1226 Flushing Ave., Brooklyn 37, N. Y.
Electrical, electronic and nucleonic instruments; electron tubes; components

Apex Specialties Co., 1115 Douglas Ave., Providence 4, R. I.
Magnifiers; lens fitting heaters and cones

Applied Physics Corp., 362 W. Colorado St., Pasadena 1, Calif.
Cary recording quartz spectrophotometers; vibrating reed electrometers; color analyzers

Applied Research Labs., P. O. Box 1710, Glendale 5, Calif.
Spectrochemical equipment, including grating spectrographs; optical emission quantometers; X-ray fluorescence spectrometers and quantometers; source units; microphotometers; related accessories
(See advertisement on page 198)

Applied Science Corp. of Princeton, P. O. Box 44, Princeton, N. J.
Research and development in electronics and physics

Arachne Laboratory, P. O. Box 1606, Huntington, W. Va.
Laboratory supply house

Aremac Associates, 50 So. San Gabriel Blvd., Pasadena 10, Calif.
Optical instrumentation; cameras

Arens Controls, Inc., 2017 Greenleaf St., Evanston, Ill.
Remote control systems

A.R.F. Products Inc., 7627 Lake St., River Forest, Ill.
Electrical instrumentation, remote control equipment

Arga Div., see Helipot

Aristo Grid Lamp Products, Inc., 106-23 Metropolitan Ave., Forest Hills, L. I., N. Y.
Visible spectrum and ultraviolet lamps

Aristo Import Co., Inc., 630 Fifth Ave., New York 20, N. Y.
Stop watches

Arizona Tool & Die Co., 31 E. Rillito St., Tucson, Ariz.
Gages; micrometers; optical comparators; shop equipment

Ark Engineering Co., 431 W. Tabor Rd., Philadelphia 20, Pa.
Electrical measuring and testing equipment

Arlin Products, Inc., 13541 Auburn Ave., Detroit 23, Mich.
Electronic inspection equipment; gage heads; micrometers; automatic control systems

Arlington Aluminum Co., 19011 W. Davison Rd., Detroit 23, Mich.
Racks and supports for tubes and cables

Arma Div., Am. Bosen Arma Corp., Roosevelt Field, Garden City, N. Y.
Servomechanisms; computers; gyroscopes; navigation, guidance and fire control systems

Armco Steel Corp., Middletown, Ohio

Armel Electronics, Inc., 840 S. Ave., Brooklyn 32, N. Y.
Terminals; terminal strips, blocks; sockets; connectors; related components

Armour & Co., Curled Hair Dept. & Coated Abrasives Div., North Benton Rd., Alliance, Ohio
Packaging materials; sand paper

Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago 30, Ill.

Arnhold Ceramics, Inc., 1 East 57th St., New York 22, N. Y.
Electrical and electronic components

Arnold Engineering Co., P. O. Box G, Marengo, Ill.
Permanent magnets

Arnold Magnetics Co., 5962 Smiley Drive, Culver City, Calif.
Magnetic amplifiers; Hi-Q filters; toroidal coil winding equipment

Arnoux Corp., 11924 W. Washington Blvd., Los Angeles 66, Calif.
Developement and manufacture of airborne and industrial instrumentation equipment including: temperature and pressure control systems; magnetic amplifiers; temperature transducers
(See advertisement on pages 168 & 214)

Aronson Machine Co., Arcade, N. Y.

Arrow Electronics, Inc., 65 Cortlandt St., New York 7, N. Y.
Electronic equipment and parts distributor

Arrow-Hart & Hegeman Electric Co., 103 Hawthorne St., Hartford 6, Conn.
Magnetic, mercury & relay switches

Art Wire & Stamping Co., 227 High St., Newark 2, N. J.
Precision wire forms

Artisan Metal Works Co., 11400 Madison Ave., Cleveland 2, Ohio
Instrument chassis, racks and cabinets

Asam Mfg. Co., 1629 W. Fort St., Detroit 16, Mich.

Asch Equipment Co., 642 Keowee St., Dayton 4, Ohio
Force measuring equipment

Ashland Electric Products Co., 32-02 Queens Blvd., Long Island City 1, N. Y.
Special electric motors

Ashton Valve Company, 43 Kendrick St., Wrentham, Mass.
Pop safety & relief valves; pressure gages; gage testers and master-pilot and master pressure gages

Askania Regulator Co., 240 E. Ontario St., Chicago 11, Ill.
Automatic control instruments

Askania-Werke, A. G., 4913 Cordell Ave., Bethesda, Md.

Assembly Products, Inc. Chesterland 11, Ohio
Electrical and electronic instruments; and accessories
(See advertisement on pages 176, 182, 185, 213)

Associated Research, Inc., 3758 W. Belmont Ave., Chicago 18, Ill.
Vibrotest insulation testing equipment. Special measuring and testing instruments of electrical nature.

Associated Specialties Co., 1751 Main St., Orefield, Pa.
Electronically regulated constant voltage and constant-current power supplies
(See advertisement on page 166)

Associated Spring Corp., Bristol, Conn.
Springs, clips, fasteners
(See advertisement on page 200)

Associated Valve & Engr. Co., 1150 W. Marquette Road, Chicago 21, Ill.
Automatic controllers; control valves; components

Astron Corp., 255 Grant Ave., E. Newark, N. J.
Capacitors

Atchley, Inc., Raymond, 2340 Sawtelle Blvd., Los Angeles 64, Calif.
Electro-hydraulic control systems; hydraulic servo-valves; torque motors; transistorized electrionic servo-amplifiers; dc electronic power supplies

Atkomatic Valve Co., Inc., 545 W. Abbott St., Indianapolis 25, Ind.
Two-way solonoid valves

Atlantic India Rubber Works, Inc., 571 W. Polk St., Chicago 7, Ill.

Atlantic Research Corp., 812 Fairfax St., Alexandria, Va.
Pressure, vibration, and acoustic pickups

Atlantic Transformer Div., New London Instrument Co., Inc., 30 Hynes Ave., Groton, Con.

Atlas E-E Corporation, Bedford Airport, Bedford, Mass.
Electronic component clips

Atlas Electric Devices Co., 4114 N. Ravenswood Ave., Chicago 13, Ill.
Machines to determine a material's resistance to the action of sunlight, sunlight and rain, and laundering

Atlas Engineering Co., 176 Blue Hill Ave., Roxbury, Mass.
Power supplies; amplifiers; electronic components

Atlas Exploration Co., 1911 W. Alabama St., Houston 6, Texas
Geophysical instruments

Atlas Valve Co., 282 South St., Newark 5, N. J.
Regulator valves

Atmosphere Control Co., Inc. 5315 Chester Ave., Philadelphia 43, Pa.
Testing instruments and machines; gas anlyzers
(See advertisement on page 103)

Atomic Instrument Co., see Baird Associates-Atomic Instrument Co.

Atomic Research Corp., P. O. Box 205, Colorado Springs, Colo.
Mass spectrographs; geophysical instruments; light sources

Atwood & Morrill Co., Salem, Mass.
Automatic control systems; control valves

Auburn Button Works, Inc., 1930 Canova Ave., Auburn, N. Y.

Auburn Mfg. Co., 10 Stack St., Middletown, Conn.
Gaskets; washers; packings

Audio Development Co., Transformer Div. 2833 13th Ave., S., Minneapolis 7, Minn.
Transformers; audio frequency equipment

Audio Instrument Co., Inc., 133 W. 14th St., New York 11, N. Y.
Audio-frequency equipment

Austin Company, Special Devices Div., 76 Ninth Ave., New York 11, N. Y.
Beta-gamma hand and foot checkers; computers and components; electrical and electronic; measuring instruments and automatic-control systems; components

Auth Electrical Specialty Co., Inc., 422 E. 53 St., New York 22, N. Y.
Signaling devices

Auto Engraver Co., Ridgefield, Conn.
Contour and 3-dimensional milling machines

Auto Control Laboratories, 5665 Selmarine Dr., Culver City, Calif.
Hydraulic servo-valves

Autocall Co., Shelby, Ohio
Electrical signaling, control & metering devices

Autoclave Engineers, Inc., 2930 W. 22nd St., Erie, Pa.
High pressure autoclaves, valves and thermocouples

Automatic & Precision Mfg. Co., 252 Hawthorne Ave., Yonkers 5, N. Y.
High-pressure seals for switches and shafts; high-pressure, self-sealing screws

Automatic Control Co., 995 University Ave., St. Paul 4, Minn.
Circuit switches for automatic level controls; automatic timing and sequence controllers

Automatic Controls Corp., 2390 Winewood, Ann Arbor, Mich.

Automatic Electric Co., 1833 W. Van Buren St., Chicago 7, Ill.
Telephone signaling and communication apparatus; relays; switches; telephone type control components

Automatic Electric Sales Corp., 1033 W. Van Buren St., Chicago 7, Ill.
Relays; rotary stepping switches, and other control components; P-A-X business telephone systems
(See advertisement on page 81)

Automatic Methods, Inc., 965 W. Grand St., Elizabeth, N. J.

Automatic Scale Co., Inc. 180 Lafayette St., New York 14, N. Y.
Automatic Scales

Automatic Steam Products Corp., 140 W. 31st St., New York, N. Y.
Water demineralizers; steam generators

Automatic Switch Co., 391 Lakeside Ave., Orange, N. J.
Solenoid valves and automatic electric control apparatus

Automatic Temperature Control Co., 5200 Pulaski Ave., Philadelphia 44, Pa.
Timers, time control and specialty engineering; valves and valve controllers; relays.
(See advertisement on pages 195, 205, 221, 222)

Automatic Valve Controller Co., Box 268, Tulsa 1, Okla.
Automatic valve control

Automation Corp. of America, 3523 Satsuma Ave., North Hollywood, Calif.
General purpose control systems for automatic operation of machine tools; magnetic recording equipment

Automation Equipment, Inc., 428 S. Cherry St., Wallingford, Conn.

Automation Products, Inc., 3030 Maxroy St., Houston, 24, Texas
Electrical and electronic controls; electrical and pneumatic operated valves

Autonetics Div., North American Aviation, Inc., P.O. Box AN, Bellflower, Calif.

Autoscrew Co., 216 W. 18th St., New York 11, N. Y.
Instrument Screws

Autotron Co., Danville, Ill.
Automatic inspection devices

Autron Engineering, Inc., 1254 W. 6th St., Los Angeles 17, Calif.
Control devices

Aviation Engineering Corp., 34-56 58th St., Woodside, N. Y.
Industrial measuring and automatic-control devices; remote-control systems; testers; electrical and electronic instruments and components; regulators; computer components

Avien, Inc., 58-15 Northern Blvd., Woodside, L. I., N. Y.
Aircraft instruments; systems and system components for fuel gaging and fuel management, engine temperature and fuel flow instrumentation.

Avion Div., ACF Industries, Inc., 299 Highway #17, Paramus, N. J.
Electrical and mechanical measuring instruments and automatic control systems

Avionic Products Engr. Corp., Route No. 46, Dover, N. J.
Aircraft measuring and automatic control instrumentation

Avionic Supply, 1223 Venice Blvd., Los Angeles 6, Calif.
Distributors of new and used instruments and control equipment

B

B & F Instruments, Inc., 4732 N. Broad St., Philadelphia 41, Pa.
Torque and acceleration measuring equipment; bridge-balance and calibrating units
(See advertisement on pages 58, 71)

B & H Instrument Co., Inc., 3479 W. Vickery St., Fort Worth 7, Texas

B-I-F Industries, Inc., 345 Harris Ave., Providence 1, R. I.
Equipment for control and processing of solids, liquids and gases

B & K Manufacturing Co., 3726 N. Southport Ave., Chicago 13, Ill.
Test equipment calibrators; video pattern and picture generators; shorted turns indicators; electron tube testers; CRT testers; and rejuvenators

B/W Controller Corp., 2200 E. Maple Rd., Birmingham, Mich.
Floatless liquid level controls
(See advertisement on page 132)

Babcock Relays, Inc., 14743 Lull St., P. O. Box 3062, Van Nuys, Calif.
Subminiature, sensitive, and polarized relays

Bacharach Industrial Instrument Co., 7301 Penn Ave., Pittsburgh 8, Pa.
Portable CO_2 and oxygen indicators; CO detectors; portable indicating and recording thermometers; relative humidity indicators; smoke testers; air filter gages; electrical operation recorders

Bache & Company, Semon, Greenwich & Morton Sts., New York 14, N. Y.
Mirrors, plate glass, sheet glass, glass specialties, gage glass tubes, optical parts
(See advertisement on page 123)

Badger Meter Mfg. Co., 2371 N. 30th St., Milwaukee 45, Wis.
Liquid meters

Bailey Meter Co., 1041 Ivanhoe Rd., Cleveland 10, Ohio
Electrical, mechanical, and pneumatic equipment for indicating, recording, and controlling such factors as: combustion, flow, liquid level, temperature and pressure
(See advertisement on pages 70, 84, 89, 90, 110, 112, 115, 118, 132, 158, 169, 175, 177, 178, 181, 197, 210, 211, 229, 232)

Baird Associates-Atomic Instrument Co., 33 University Rd., Cambridge 38, Mass.
Optical, mechanical and electronic equipment for spectrochemical analysis; radioactivity instrumentation; electronic counting and control devices
(See advertisement on page 118)

Bakelite Div., Union Carbide & Carbon Corp., 3[illegible] E. 42nd St., New York 17, N. Y.

Baker Co., Maplewood, Maine
Testers, cleaners and tooling for ball bearings and small parts

Baker & Co., Inc., 113 Astor St., Newark 5, N. J.
Thermocouple wire; microchemical apparatus; rupture disks; precious metals

Baker Compass Co., Melrose, Mass.
Compasses

Balco Research Labs., 49-53 Edison Place, Newark 2, N. J.
Capacitors; radio noise filters

Baldwin-Lima-Hamilton Corp., Electronics and Instrumentation Div., Waltham 54, Mass.
Physical testing machines; strain gages; transducers

Ballantine Labs., Inc., Boonton, N. J.
Precision electronic voltmeters and accessories
(See advertisement on page 240)

Ballastran Corp., 1701 N. Calhoun St., Fort Wayne 7, Ind.
Instrument and power transformers

Balloffet-Vianney Wire Die Co., Inc., 6825 Adams St., Guttenburg, N. J.

Balteau Electric Corp., New & Meadow Sts., Stamford, Conn.
Electrical and x-ray instrumentation; cameras

Baltic Metal Products Co., 122 Sutton St., Brooklyn 22, N. Y.
Custom built panels, rack and console housing

Baltimore Biological Laboratory, Inc., 1640 Gorsuch Ave., Baltimore, 18, Md.
Laboratory filling machines, pumps, etc.

Bar-Ray Products, Inc., 209 25th St., Brooklyn 32, N. Y.
X-ray equipment

Barber-Colman Co., P. O. Drawer 99, Rockford, Ill.
Automatic controlling instruments for temperature, humidity, pressure liquid level, moisture regain; motor-operated valves; solenoid valves; electric power units; damper controllers, voltage-sensitive relays; associated switches and relays, fractional-hp motors; geared motor units; and hardness testers

Barber Laboratories, Alfred W., 34-04 Francis Lewis Blvd., Flushing, L. I., N. Y.
Voltmeters

Barbour Stockwell Co., 205 Broadway, Cambridge 3[illegible], Mass.
Tachometers

Barclay Instrument Div., Patent Button Co., Waterbury 20, Conn.
Polargraphic equipment; flame photometers

Barksdale Valves, 5125 Alcoa Ave., Los Angeles 58, Calif.
Control valves; valve operating devices; pressure regulators, auxiliaries

Barnes Development Co., 213 W. Baltimore Pike, Lansdowne, Pa.
Electrical instruments; automatic inspection devices; motion picture cameras
(see advertisement on pages 72, 197)

Barnes Engineering Co., 30 Commerce Rd., Stamford, Conn.
Automatic assembly machines; programmed machine tool controls; infrared instruments and systems

Barnes Co., W. F. & John, 301 S. Water St., Rockford, Ill.
Automatic control equipment

Barnstead Still and Sterilizer Co., 2 Lansville Terrance, Boston 31, Mass.
Water stills

Barron, Alexander F., 53 W. Jackson Blvd., Chicago 4, Ill.
Engine controllers; constant-rate battery chargers

Bart-Messing Corp., 229 Main St., Belleville, N. J.

Bartelt Engineering Co., 1214 Patridge Ave., Beloit, Wis.
Pedestal micrometers

Barrows Porcelain Co., Langdon Farm & Penn R. R., Cincinnati 13, Ohio
Steel, glass-coated (plated) pyrometer tubes

Barry Controls, Inc., 700 Pleasant St., Watertown 72, Mass.
Vibration mountings and isolators

Barton Instrument Corp., 580 Monterey Pass Rd., Monterey Park, Calif.
Rupture-proof bellows instruments for measuring flow, liquid level, and differential pressure
(See advertisement on page 110)

Basler Electric Co., 601 Fifth St., Highland, Ill.
Transformers; inductors; chokes

Bastian Bros. Co., 1700 N. Clinton Ave., Rochester 1, N. Y.

Bastian-Blessing Co., 4201 W. Peterson St., Chicago 30, Ill.
Control equipment for high pressure gases

Bausch & Lomb Optical Co., 738 St. Paul St., Rochester 2, N. Y.
Optical instruments for industrial, scientific and educational use including microscopes, colorimeters, refractometers, photomicrographic and metallographic equipment, contour measuring projector, optical glass and special optical systems

Bayley Instrument Co., P. O. Box 538, Danville, Calif. Small flowmeters; electronic temperature controllers; laboratory circulating pumps; constant temperature baths

Bayside Watch Tool Co., 20-02 Utopia Pkwy. Whitestone 57, N. Y.
Machines, tools and dies for watch, clock and instrument industries

Beacon Gage Co., 11 River St., Wellesley, Mass.
Pressure gages

Bead Chain Manufacturing Co., 93 Mount Grove St., Bridgeport 5, Conn.
Contact pins, terminals, jacks and sleeves; kinkless chain.

Beam Instruments Corp., 350 Fifth Ave., New York 1, N. Y.
Electronic instruments; cameras; testers

Beamco, Inc., Irving Park & Church Rds., Bensenville, Ill.
Custom-made precision parts and products

Bear Manufacturing Co., 2030 5th Ave., Rock Island, Ill.
Balancing machines

Beaver Gear Works, Inc., 1025 Parmele St., Rockford, Ill.

Beck Bros., 421 W. Sedgley Ave., Philadelphia 40, Pa.
Resistors

Beck Co., Harold, 3640 N. Second St., Philadelphia 40, Pa.
Pyrometer controllers

Becker Co., Richard F., 3020 N. Cicero, Chicago 41, Ill.
Plug-in timers for on-off cycling, process and production timing, etc.

Becker Div., Christian see Torsion Balance Co.

Beckman, Inc., Arnold O., 1020 Mission St., So. Pasadena, Calif.
Gas analyzers and sampling systems for oxygen, hydrogen, carbon dioxide, etc., in industrial gas streams

Beckman Div., Beckman Instruments, Inc., 2500 Fullerton Rd., Fullerton, Calif.
pH instruments and electro-metric pH equipment for completely automatic indication, control and recording

Beckman & Whitley, 985 San Carlos Ave., San Carlos, Calif.
Anemometers, special cameras, thermal radiometers.

Beede Electrical Instrument Co., Inc., Penacook, N. H.
Small electrical panel instruments

Behlman Engineering Co., 114 S. Hollywood Way, Burbank, Calif.
Electronic ac power sources, milliwatt to kilowatt power output, and subsonic to supersonic frequency output accuracies up to 0.001%

Behm & Sons Co., George, 24 McDonough St., Dayton 2, Ohio

Bekey Electric Co., Inc., 1327 S. Main St., Los Angeles 15, Calif.
Motors, frequency changers and generators, and associated rotary electrical equipment

Bel-Art Products, 4917 Murphy Place, West New York, N. Y.
Plastic tubing and cylinders; instrument covers

Belden Mfg. Co., P.O. Box 5070A, Chicago 80, Ill.

Bell Automation Corp., 749 Monroe Ave., Rochester 7, N. Y.

Bell & Howell Co., 7100 McCormic Rd., Chicago 45, Ill.
Motion picture equipment including cameras, projectors, and accessories

Bell Sound Systems, Inc., 555 Marion Rd., Columbus 7, Ohio
Audio frequency instruments; amplifiers; hi-fi components

Bellco Glass, Inc., 413 N. 4th St., Vineland, N. J.
Glass apparatus; viscosity tubes; pipettes, and other components

Bellmore Gear Corp., 2307 Bellmore Ave., Bellmore, N. Y.
Fine pitch precision gears; gear assemblies; motor gear heads; gear trains; mechanical instrument assemblies; splines
(See advertisement on page 119)

Bellofram Corp., 144 Moody St., Waltham, Mass.
Pneumatic relays; air and gas pressure regulators; air volume boosters

Bellows Co., 230 W. Market St., Akron 3, Ohio
Air motors; compressors; dryers

Belmont Smelting and Refining Works, 330 Belmont Ave., Brooklyn 7, N. Y.

Belock Instrument Corp., 111th St. & 14th Ave., College Point, N. Y.
Military and naval force-control instruments; magnetic clutches; servo testing devices

Benchmaster Mfg. Co., 1835 W. Rosecrans Ave., Gardena, Calif.

Bendix Aviation Corp., 1104 Fisher Bldg., Detroit, Mich.
Aircraft, marine and ground instrumentation; control and telemetering systems; testing instruments; meteorological instruments

Bendix Aviation Corp., Cincinnati Div., 3130 Wassau Rd., Cincinnati 8, Ohio

Bendix Aviation Corp., Computer Div., 5630 Arbor Vitae St., Los Angeles 45, Calif.
General purpose computers

Bendix Aviation Corp., Friez Instrument Div., 1400-P Taylor Ave., Baltimore 4, Md.
Temperature and humidity controls; gas and stoker controls; damper motors; electrical relays; temperature and humidity indicators and recorders; psychrometers; draft gages; anemometers; CO_2 analyzers

Bendix Aviation Corp., Eclipse-Pioneer Div., 95 First St., Teterboro, N. J.
Electrical and mechanical aircraft instruments; remote control systems

Bendix Aviation Corp., Pacific Div., 1160 Sherman Way, N. Hollywood, Calif.
Airborne radar, sonar, missile guidance; analog and digital telemetering; aircraft hydraulics; electromechanical actuators; timers, and motors

Bendix Aviation Corp., Pioneer-Central Div., Davenport, Iowa
Oxygen regulators; liquid oxygen systems; fuel flowmeter systems; flight instruments; ultrasonic cleaning systems; test equipment and tools

Bendix Aviation Corp., Red Bank Div., Eatontown, N. J.
Radioactivity instruments; generators; power supplies; special purpose electron tubes

Bendix Aviation Corp., Scintilla Div., Sudney, N. Y.

Bendix Aviation Corp., Utica Div., French Rd., Utica, N. Y.

Bennett Products Mfg. Co., see Farnsworth, Alto, Calif.

Benson-Lehner Corp., 11930 W. Olympic Blvd., West Los Angeles, Calif.
Computers; digitizers; trace readers; printers; components

Bentley, Harris Manufacturing Co., 1003 Bently St., Conshohocken, Pa.

Bergander Mfg. Co., 2129 Warner Ave., Chicago 18, Ill.
Hardware and tools

Berger & Sons, Inc., C. L., 37 Williams St., Boston 19, Mass.
Surveying instruments

Berger Scientific Supplies, Inc., 37 Williams St., Boston 19, Mass.
Laboratory supply house

Berkeley Div., Beckman Inst., Inc., 2200 Wright Ave., Richmond, Calif.
Electrical and electronic instruments for analysis and computing; frequency meters and standards; automatic-control systems; EASE analog simulation equipment

Berkshire Chemicals, Inc., 420 Lexington Ave., New York 17, N. Y.

Berkshire Laboratories, 582 Bank Village, Greenville, New Hampshire
Electronic instruments; plug-in components and circuits; pulse transformers; stroboscopes; special instruments
(See advertisement on page 225)

Berndt-Bach, Inc., 6962 Romaine St., Hollywood 38, Calif.
Sound-on-film cameras; electrical and electronic instruments; components

Beryllium Corporation, Reading, Pa.
Beryllium copper alloy products

Beseler Co., Charles, 60 Badger Ave., Newark 8, N. J.
Optical projectors, galvanometer projectors, delineascopes

Best Scientific Glass App. Wks., 2449 N. Clyburn St., Chicago 14, Ill.

Beta Corp., Forest Ave., at Ridge Rd., P. O. Box 8625, Richmond 26, Va.
Vibration and acceleration actuated monitors, relays and switches for detecting unbalance and mechanical malfunctioning in rotary equipment; statistical accelerometers; vibrometers
(See advertisement on page 237)

Beta Electric Corp., 333 E. 103rd St., New York 29, N. Y.
High voltage and very high voltage power supplies; testing equipment; electronic micro-ammeters; kilovoltmeters

Bethlehem Apparatus Co., Front & Depot Sts., Hellertown, Pa.
Laboratory apparatus; mercury cleaning machines

Better Coil & Transformer Corp., Goodland, Ind.
Coils; transformers

Betts & Betts Corp., 551 W. 52nd St., New York 19, N. Y.
Multiple circuit timers; controls; time delay relays; motor driven thermostatic interrupters

Beva Laboratory, P. O. Box 478, Trenton, N. J.
Power supplies; wave analyzers; amplifiers

Bicknell-Thomas Co., 90 Wells St., Greenfield, Mass.

Biddle Co., James G., 1316 Arch St., Philadelphia 7, Pa.
Insulation testers; ground testers and ohmmeters; speed-measuring instruments; frequency meters; sliding-contact rheostats
(See advertisement on pages 114, 127, 189, 209)

Biggs Co., Carl H., 2255 Barry Ave., Los Angeles 64, Calif.
Potting compounds, epoxy types; cements and adhesives; epoxy types; protective metal coatings
(See advertisement on page 165)

Bin-Dicator Co., 13946 Kercheval, Detroit 15, Mich.
Automatic bin level indication and control, aerator units
(See advertisement on page 132)

Binswanger & Co., 645-655 Union Ave., Memphis 1, Tenn.
Lenses, prisms and filters; glass of every description

Bio-Rad Laboratories, 800 Delaware St., Berkeley, Calif.
Water deionizers; radioactive sources; crystals

Bird Electronic Corp., 1800 E. 38th St., Cleveland 14, Ohio
Switches; wattmeters

Bird & Co., Inc., Richard H., 1 Spruce St., Waltham 54, Mass.
Jewel bearings
(See advertisement on page 128)

Birnbach Radio Co., Inc., 145 Hudson St., New York 13, N. Y.

Birnbach Radio Co., Inc., 145 Hudson St., New York 13, N. Y.

Bishop & Co., J., Platinum Works, Malvern, Pa.
Laboratory apparatus; pyrometer tubes

Black & Decker Mfg. Co., 715 Pennsylvania Ave., Towson 4, Md.
Truck scales; testing machines

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 26, Mo., Climax Controls Div., Box 1529, Tulsa, Okla.
Diaphragm controls; drainers. regulators; pilots; relays; safety heads; controls for liquid level, pressure, temperature, flow of air, gas, vapor, steam, liquid
(See advertisement on pages 14-15)

Black & Webster, Inc., 445 Watertown St., Newton 58, Mass.
Pellet presses; time study apparatus

Blake Co., Edward, 437 Cherry St., West Newton 65, Mass.
Dimensional gages; surface-finish comparators and standard; surface-finish testing sets

Blanchard Machine Co., 64 State St., Cambridge 39, Mass.
Surface grinding machines; segment chucks; demagnetizers

Bliley Electric Co., 200 Union Station Bldg., Erie, Pa.
Quartz piezo-electric crystals; frequency standards; delay lines

Bliss & Co., Inc., John, 84 Pearl St., New York 4, N. Y.
Marine instruments

Block Mfg. Co., Dairy Rd., Parktour, Md.

Blockson & Co., E. 5th St. & Canal, Michigan City, Ind.

Blue M Electric Co., 138th & Chatham St., Blue Island, Ill.
Furnaces and furnace-control systems

Blum & Co., Julius, Carlstadt, N. J.

Bock Machine Co., 2950 Jonrose Ave., Cincinnati 24, Ohio
Erichsen sheet metal testing machine

Bodine Electric Co., 2254 W. Ohio St., Chicago 12, Ill.
Motors, (all types of windings from 1/20000 to 1/6 hp.); speed reducers and non-reducer motors

Bodnar Industries Inc., 238 Auguenot St., New Rochelle, N. Y.

Boehme, Inc., H. O., 915 Broadway, New York 10, N. Y.

Boehmke Optical Co., 3737 Bird Road, Miami 33, Fla.
Precision optical manufacturers

Boekel & Co., Wm., 509-519 Vine St., Philadelphia 6, Pa.
Laboratory apparatus

Bogart Manufacturing Co., 315 Siegel St., Brooklyn 6, N. Y.
Microwave components. radar assemblies

Bogue Electric Mfg. Co., 52 Iowa Ave., Patterson 3, N. J.
Voltage and speed regulators; magnetic amplifiers and controllers; ac and dc motors and generators; switchboards

Bolsey Corp. of America, 118 E. 25th St., New York, N. Y.
Optical equipment, cameras and projectors

Bomac Laboratories, Inc., Beverly, Mass.

Bone Engineering Corp., 701 W. Broadway, Glendale 4, Calif.
Magnetic amplifiers; regulated power supplies

Bond Electronics Corp., 60 Springfield Ave., Springfield, Ill.

Boonton Molding Co., 326 Myrtle Ave., Boonton, N. J.
Boonton Radio Corp., P. O. Box 390, Boonton, N. J.
Electronic test instruments; aircraft glide slope and omni-range navigational system test equipment; metal film gauges

Borden Engineering, Div., Johnson Aircraft Engineering Co., 39 E. Hanover Ave., Morris Plains, N. J.
Ground resistance meters; pipe locators; signal generators

Borel & Co., Jules, 1015 Walnut St., Kansas City 6, Mo.

Borg Corp., Geo. W., Equipt. Div., 120 S. Main St., Janesville, Wis.
Precision multiturn potentiometers; concentric scale, direct reading counting dials; sub-fractional induction and synchronous motors
(See advertisement on page 53)

Boston Auto Gage Co., 70 West St., Pittsfield, Mass.
Liquid level gages and allied lines

Boston Electronics Div., Norden-Ketay Corp., Snow & Union Sts., Brighten Station, Boston 35, Mass.
Medical research instruments; pressure and vacuum gages; VTVMs

Boston-Brady Mfg. Co., Stonewall & Bailey Sts., S.W., Atlanta, Ga.
Surveying instrument

Boulin Instrument Corp., 10 First Street, Pelham, N. Y.
Chronometric hand tachometers; wound stroboscopes. electrical stroboscopes; speed indiators, and portable and stationary tachometers
(See advertisement on page 209)

Bourns Laboratories, 6135 Magnolia Ave., Riverside, Calif.
Pressure and displacement pickups; resistors
(See advertisement on page 51)

Bowen & Co., Inc., 4712 Bethesda Ave., Bethesda 14, Md.
Cement testers

Bowmar Instrument Corp., 2415 Pennsylvania St., Fort Wayne 4, Ind.
Counters; speed reducers; mechanical components

Bowser, Inc., Fort Wayne Div., 1302 E. Creighton Ave., Fort Wayne 2, Ind.
Liquid meters

Bowser Technical Refrigeration, Division of Bowser, Inc., Terryville, Conn.
Testing cabinets—low temperature, high altitude, relative humidity; explosion, sand and dust, and fungus chambers

Boylston Steam Specialty Co., 116 W. Illinois St., Chicago 10, Ill.
Regulating valves

Brabender Corp., 244 Saddle River Rd., Rochelle Park, N. J.
Industrial measuring and control apparatus for plastic and viscous material; semi-automatic moisture testers

Bradford Machine Tool Co., 702 Porter St., Lansing, Mich.

Bradley Laboratories, Inc., 168 Columbus Ave., Brooklyn 17, N. Y.
Electrical instruments

Bradshaw Instruments Co., 42 Flatbush Ave., Brooklyn 17, N. Y.
Electrical instruments

Brady Co., W. H., 727 W. Glendale Ave., Milwaukee 12, Wis.
Markers; labels; safety signs

Brainin Co., C. S., 320 Washington St., Mt. Vernon, N. Y.
Precious metal contact points and rivets; contact bimetals
(See advertisement on page 86)

Brand and Co., Inc., William, North & Valley Sts., Willimantic, Conn.
Plastic insulated wires; cables with or without textile braids; shields; nylon or vinyl jackets; plastic and coated sleevings; identification markers

Branson Corp., Boonton, N. J.

Branson Instruments, Inc., 37 Brown House Rd., Stamford, Conn.
Thickness gages (tube and sheet metal); ultrasonic generators
(See advertisement on page 220)

Branson Ultrasonic Corp., 37 Brown House Rd., Stamford, Conn.
Ultrasonic cleaning equipment
(See advertisement on page 82)

Bray Optical Co., 345 W. 1st St., Los Angeles 4, Calif.
Lenses, prisms and optical instruments; observation scopes

Brazilian Trading Co., Inc., 377 4th Ave., New York 16, N. Y.

Breeze Corporations, Inc., 700 Liberty Ave., Union, N. J.
Multiple connectors; radio ignition shielding

Brew & Co., Inc., Richard D., Airport Rd., Concord Plains, N. H.
Custom manufacturer of all types of delay lines; evaporated metal films

Bridgeport Brass Co., 30 Grand St., Bridgeport 2, Conn.

Bridgeport Thermostat Div., Robertshaw-Fulton Controls Co., 155 Hill St., Milford, Conn.
Metallic bellows and thermostats

Briggs Filtration Co., River Road, Washington 16, D. C.
Filtration equipment for lubricating oils, fuels, coolants, hydraulic fluids, insulating oils, compressed air lines, and instrument air
(See advertisement on page 58)

Brigham Co., R. B. 4139 Mayfield Drive, Toledo 10, Ohio
Photoelectric controls

Brinkmann Instruments, Inc., 378-380 Great Neck Rd., Great Neck, L. I., N. Y.
Photomicrographic equipment; balances

Bristol Co., 113 Bristol Rd., Waterbury 20, Conn.
Recording and automatic (air and electric) controlling instruments for pressure, vacuum, draft, absolute pressure, humidity, liquid lever, flow, pH temperature, and speed; including recording barometers, voltmeters, ammeters, wattmeters, dairy instruments, machine operation, motion and operation recorders, control valves, telemetering instruments, process cycle controllers, time-temperature and time-pressure controllers, potentiometers, thermal converters; dilatometers; combustible gas and vapor detectors
(See advertisement on pages 89, 159, 164, 169, 172 176, 211, 216, 218)

Bristol Brass Corp., 580 Broad St., Bristol 91, Conn.

Bristol Engineering Corp., Bristol, Pa.
Industrial and laboratory instrumentation; power supplies. components

Bristol Motor Div., see Vocaline Co. of Amer.

British Electronic Sales Co., P. O. Box 132, Oakland Gardens, Bayside 64, N. Y.
Electronic instruments and equipment
(See advertisement on page 168)

British Industries Corp., 80 Shore Rd., Port Washington, L. I., N. Y.
Audio amplifiers; solder; coil winding machines

Brodie Co., Inc., Ralph N., Alvardo & W. 137th Ave., San Leandro, Calif.
Positive displacement petroleum meters, and accessories

Bronoptics Co., 4838 Van Nuys Blvd., Sherman Oaks, Calif.
Optical research, equipment and parts

Brooke Engineering Co., Inc., 4517 Wayne Ave., Philadelphia 44, Pa.
Combustion control systems; smoke indicators and recorders

Brookfield Engineering Laboratories, Inc., 240 Cushing St., Stoughton, Mass.
Synchro-Lectric viscosimeter

Brooklyn Thermometer Co., 217-09 Merrick Blvd., Springfield Gardens 13, N. Y.
Laboratory and recording thermometers; hydrometers

Brooks Rotameter Co., P. O. Box 432, Lansdale, Pa.
Complete line of instrumentation, specializing in rotameters, for flow measurements and automatic control
(See advertisement on page 113)

Brown Electro-Measurement Corp., 4635 S.E. Hawthorne Blvd., Portland 15, Ore.
Electrical instruments and components

Brown-Brockmeyer Co., P. O. Box 989, Dayton 1, Ohio
Grinders; buffers; motors and motor controls

Brown-Morse Co., 110 E. Broadway Heights, Muskegon, Mich.
Laboratory furniture

Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Machine shop instruments

Browning Laboratories, Inc., 750 Main St., Winchester, Mass.
Frequency meters; signal generators; cathode-ray oscillographs

Brubaker Instrument Specialties, James E., 2315 Waverly Pl., Waukegan, Ill.
Motion-picture and still cameras (custom); optical components

Bruning Co., Inc., Chas., 4700 Montrose Ave., Chicago 41, Ill.
Drawing and surveying instruments

Brunson Instrument Co., 1405 Walnut St., Kansas City 6, Mo.
Surveying instruments

Brunswick Instruments, P. O. Box 813, New Brunswick, N. J.
Phase sequence indicators; voltmeter inverters; voltage coefficient test sets

Brunt & Co., 6905 W. 65th St., Chicago 38, Ill.

Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio
Oscillographs. vibration and motion pickups; amplifiers; surface comparators and analyzers; electrical testing instruments; components
(See advertisement on pages 6-7)

Bryant Chucking Grinder Co., P. O. Box 789, Springfield, Vt.
Screw thread gages; internal grinders; magnetic drums for computers

Buchanan Electrical Products Corp., 225 U. S. Highway #22, Hillside, N. J.
Terminal blocks; terminals; solderless installation tools

Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, Ohio
Electronic components; instrument housings and panels

Buehler, Ltd., 2120 Greenwood St., Evanston, Ill.
Laboratory supply house

Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y.
Liquid meters for measurement of cold water, hot water, oils, chemicals; integrating registers, cumulative, setback, or predetermined control
(See advertisement on page 112)

Buffalo Scale Co., 46 Letchworth St., Buffalo 13, N. Y.
Scales

Buggie & Co., H. H., 726 Stanton St., Toledo 1, Ohio
Connectors, plugs, jacks, clips

Buhl Optical Co., 1009 Beech Ave., Pittsburgh 33, Pa.

Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I.
Instruments for indicating recording controlling flow, liquid level, pressure, temperature, and weight

Bullard Co., E. D., 275 Eighth St., San Francisco 3, Calif.
Gas leak detectors

Bunnell & Company, J. H., 81 Prospect St., Brooklyn 1, N. Y.
Relays & switches

Burrott Mills, 616 W. Fulton St., Chicago 6, Ill.

Burnett Mfg. Co., 3433 W. Madison St., Chicago 24, Ill.

Burgess Battery Co., Freeport, Ill.
Dry-cell batteries for flashlights, lanterns, portable and farm radios, ignition, hearing aids, industrial electronic and transistor applications
(See advertisement on page 69)

Burke Electric Co., 8544 Grand River Ave., Detroit 4, Mich.
Fractional horsepower motors

Burke & James, Inc., 321 S. Wabash, Chicago 4, Ill.
Photographic equipment for research and laboratory departments

Burke, Louis, 41 John St., New York, N. Y.
Stop watches and chronometers

Burling Instrument Co., 16 River Rd., Chatham, N. J.
Automatic temperature controllers

Burlington Instrument Co., 203 North 3rd St., Burlington, Iowa
Electrical control apparatus

Burndy Corp., Norwalk, Conn.
Connectors, plugs and jacks

Burnell & Co., Inc., 45 Warburton Ave., Yonkers, N. Y.
Wave filters; components

Burrell Corp., 2223 Fifth Ave., Pittsburgh 19, Pa.
Scientific instruments & laboratory supplies

Burroughs Corp., Electronics Inst. Div., 1209 Vine St., Phila. 7, Pa.
Computers; automatic regulators; electrical and electronic instruments and components

Burrows Equipment Co., 1316 Sherman Ave., Evanston, Ill.
Moisture testers

Burton Mfg. Co., Colorado Ave. at 26th St., Santa Monica, Calif.
Industrial & Aircraft electrical & optical instruments

Burton-Rogers Co., 42 Casleton St., Cambridge, Mass.

Bush Associates, G. F., Box 175, Princeton, N. J.
Rubber, plastics and textile testers; laboratory apparatus

Bushnell & Co., D. P., 240 Bushnell Bldg., Pasadena 1, Calif.
Binoculars, microscopes, telescopes, and other optical instruments; accessories and supplies
(See advertisement on page 191)

Butler Manufacturing Corp., 5516 Dorsey Lane, Washington 16, D. C.
Counters; digital computers switches; components

C

CBS-Hytron Div., Columbia Broadcasting System, Inc., 100 Endicott St., Danvers, Mass.
Electronic tubes

CGS Labs., Inc., 391 Ludlow St., Stamford, Conn.
Electrical instruments; computers; remote control system

C and H Supply Co., 415 E. Beach Ave., Inglewood 3, Calif.
Nameplates; marking devices

Cadillac Gage Co., 20316 Hoover Road, Detroit 5, Mich.
Dimensional gages

Cady & Co., E. J., 630 N. Harlem Ave., River Forest, Ill.
Non-destructive testers for physical properties

Cal-Astro Optical Laboratories, 1625 E. Washington St., Pasadena 7, Calif.
Precision optical parts

Calcetron, Inc., 2444 Beverly Rd., St. Paul 4, Minn.
Fluorimeters

Caldwell, Farley M., 3201 Golden Ave., Cincinnati 26, Ohio

Caledonia Electronics and Transformer Corp., Maple St., Caledonia, N. Y.
Audio, power and pulse transformers; charging and saturable reactors; high voltage dc power supplies

Calidyne Co., 120 Cross St., Winchester, Mass.
Accelerometers and vibration pickups; a.f. voltage standards; power supplies

California Computer Products, 3927 W. Jefferson Blvd., Los Angeles 16, Calif.
X-Y recorders operated by step motors actuated by pulses from a digital differential analyzer

California Magnetic Control Corp., 11922 Valerio St., N. Hollywood, Calif.
Electrical instruments; testers; transformers

Callahan & Co., E. J., 5 N. Haven St., Baltimore, Md.
Laboratory supply house

Calresin Corp., 4545 Brazil St., Los Angeles 39, Calif.

Cal-Tronics Corp., 11307 Hindry St., Los Angeles 45, Calif.
Production, depot and field test equipment for radar, computer and missile systems

Cambridge Instrument Co., Inc., 3614 Grand Central Terminal, New York 17, N. Y.
Scientific and industrial instruments

Cambridge Thermionic Corp., 445 Concord Ave., Cambridge 38, Mass.
Monochromators; electric counters

Cameron Iron Works, Inc., P. O. Box 1212, Houston, Texas
Pressure gages; dynamometers; valves and valve-operating units

Cameron Surgical Specialty Co., 666 W. Division St., Chicago 10, Ill.
Surgical instruments

Campbell Co., J. A., 645 Wardlow Rd., Long Beach 7, Calif.
Thermometer wells and automatic controllers

Canadian Radium & Uranium Corp., 630 Fifth Ave., New York 20, N. Y.
Luminous, phosphorescent, and fluorescent paints for applications on dials, panels, nameplates; flat, convex and concave surfaces
(See advertisement on page 161)

Canfield Rubber Co., 708 Railroad Ave. Bridgeport, Conn.
Molded extruded, bonded and stamped rubber and synthetic rubber parts for insulation, vibration-absorption, sealing, supporting and protecting instruments etc.
(See advertisement on page 191)

Cannon Electric Co., 3209 Humboldt St., Los Angeles, 31, Calif.
Multiple circuit connectors for instruments; dc solenoids
(See advertisement on page 87)

Cannon Instrument Co., Box 812, State College, Pa.
Temperature and pressure controllers; viscometers

Canoga Corp., 5955 Sepulveda Blvd., Van Nuys, Calif.
Radio and radar instrumentation, and test equipment

Capcon Corp., 25 Willett St., New York 2, N. Y.
Capacitors and filters

Capeway Instrument Corp., Highland Ave. at N. Bedford St., East Bridgewater, Mass.
Elapsed time recorders

Carad Corp., 2850 Bay Rd., Redwood City, Calif.
Pulse transformers; pulse forming networks; wave filters & toroidal inductors; modulators

Carbide & Carbon Chemical Co., 30 E. 42nd St., New York 17, N. Y.
Instrument lubricating oils

Carborundum Co., Niagara Falls, N. Y.

Cargille Scientific, Inc., 117 Liberty St., New York 6, N. Y.
Chemical laboratory and photographic devices; immersion liquids for inspecting glass & quartz

Cardwell Mfg. Corp., Allen D., 97 Whiting St., Plainville, Conn.
Electrical and electronic instrumentation. control systems; power units; radar equipment; industrial TV; components

Cargo Packers Inc., 88th St. & 73rd Ave., Glendale, N. Y.

Carlingo Commodities Corp., 15 William St., New York 5, N. Y.
Pyrometers and temperature controllers

Carol Electronics Corp., 315 W. Stephens St., Martinsburg, W. Va.

Carroll Co., J. B., 319 N. Albany Ave., Chicago 12, Ill.
Products manufactured from plastic sheet materials

Carruthers & Fernandez, Inc., 1501 Colorado Ave., Santa Monica, Calif.
Control valves; power units; solenoids; pressure switches

Carter Mfg. Corp., 23 Washington St., Hudson, Mass.
Potentiometers, potentiometer test equipment

Carter Motor Co., 2711 W. George St., Chicago 18, Ill.
Dc to ac converters; dynamotors; generators; magmotors; inverters.
(See advertisement on page 100)

Carter Parts Co., 3401 Madison St., Skokie, Ill.
Relays; resistors; rheostats and switches

Carver, Inc., Fred S., One Chatham Road, Summit, N. J.
Testing Machines; laboratory presses; high-pressure instrumentation

Cash Co., A. W., 115 So. Main St., Decatur, Ill.
Process and combustion controls; pressure reducing relief, back pressure regulating, hydraulic, expansion valves; governors; water regulators; pressure and temperature controls
(See advertisement on page 56)

Cash Valve Mfg. Corp., A. W., 6619 East Wabash, Decatur 60, Ill.
Pressure, vacuum and temperature controllers; control valves

Cast Optics Corp., 123 Newman Street, Hackensack, N. J.
Laboratory supply house

Cedar Engineering, Inc., 5806 W. 36th St., Minneapolis 16, Minn.
Aircraft electro mechanical controls and systems, including accelerometers, gyros, autopilots, sensing, and guidance devices

Central Instrument Co., 565 E. Milwaukee, Detroit 2, Mich.
Pressure and vacuum indicators and recorders

Central Research Labs., Inc., Red Wing, Minn.
Electronic instruments; microwave equipment

Central Scientific Co., 1700 Irving Park Blvd., Chicago 13, Ill.
Scientific instruments & laboratory apparatus
(See advertisement on page 231)

Centralab Div., Globe Union Inc., 900 E. Keefe Ave., Milwaukee 4, Wis.
Carbon and wirebound and variable resistors; ceramic and phenolic switches; tubular and disc ceramic capacitors; packaged electronic circuits. steatite ceramics; semi-conductors

Centrico, Inc., 75 W. Forest Ave., Englewood, N. J.
Centrifuges

Century Controls Corp., Allen Blvd., Farmingdale, N. Y.
Tubing fittings; pneumatic valves and regulators

Century Electronics & Instruments, Inc., 1333 N. Utica St., Tulsa 10, Okla.
Recording oscillographs; electronic instruments; pressure switches

Century Geophysical Corp., 1333 N. Utica Ave., Tulsa 10, Okla.
Geophysical instruments

Century Instrument Co., 565 E. Milwaukee Ave., Detroit 2, Mich.
Temperature regulators and recording controllers for water heaters, process and plating tanks; diaphragm valves

Ceramseal Co., P. O. Box 25, New Lebanon Center, N. Y.

Cerro de Pasco Corp., 300 Park Ave., New York 22, N. Y.
Low temperature melting bismuth alloys

Chace Co., W. M., 1600 Beard Ave., Detroit 9, Mich.
Thermostatic bimetals

Chadwick-Helmuth Co., 472 E. Duarte Rd., Monrovia, Calif.
Stroboscopic light synchronizers; pulse generators for stroboscopes; oscilloscope synchronizers

Chaloux & Co., John J., Watervliet, N. Y.

Champion Spark Plug Co., Ceramic Div., 8525 Butler Ave., Detroit 11, Mich.

Chandler & Stedman, 398-A Newton St., Waltham 54, Mass.
Special laboratory apparatus

Channer Corp., 1488 Skokie Blvd., Highland Park, Ill.

Chapman Laboratories, P. O. Box 207, West Chester, Pa.

Charvos-Roos Corp., 185 Hackensack St., East Rutherford, N. J.
Drawing instruments

Chase Brass & Copper Co., Waterbury, Conn.

Chatham Controls Corp., 110 Summit Ave., Summit, N. J.

Chatham Electronics Corp., Div. of Gera Corp., 630 W. Mt. Pleasant Ave., Livingston, N. J.
Electronic devices; radio tubes; equipment and mechanical assemblies; radiological survey meters. radio communication equipment; amplifiers; relays; selenium rectifiers; transformer-rectifier units

Chatillon & Sons, John, 85 Cliff St., New York 38, N. Y.
Iso-elastic springs

Chelsea Clock Company, 284 Everett Ave., Chelsea, Mass.
Clock, and clock movements

Chemalloy Electronics Corp., Gillespie Airport, Santee, Calif.
Microwave instrumentation; alloys and solders

Chemical Rubber Co., 2310 Superior, East, Cleveland 14, Ohio
Laboratory supplies

Chemiquip Co., 460 W. Broadway, New York 12, N. Y.
Pressure snubbers; mercury traps

Cherry-Channer Corp., 42 N. Skokie Valley Rd., Highland Park, Ill.

Chesapeake Instrument Corp., Shadyside, Md.
Ultrasonic equipment; sound detectors

Chester Cable Corp., Chester, N. Y.
Flexible control cable; coaxial electric cable, and wire

Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago 22, Ill.
Laboratory supplies

Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago 47, Ill.
Paper and plastic film dielectric capacitors

Chicago Dial Co., 2917 S. La Salle St., Chicago 16, Ill.

Chicago Dial Indicator Co., 180 N. Wacker Dr., Chicago 6, Ill.
Machinists's dial indicators

Chicago Electric Tachometer Co., 111 Lake St., Madison, Ohio
Electric tachometers; portable tachometers; speed indicators

Chicago Electronic Engineering Co., 3223 W. Armitage Ave., Chicago 47, Ill.
Transformers

Chicago Industrial Instruments Co., 865 N. Sangamon St., Chicago 22, Ill.
Radio, electronic and industrial test equipment

Chicago Molded Products Corp., 1036 N. Kolmar Ave., Chicago 51, Ill.

Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Non-metallic gears and pinions. oil seals; diaphragms; packings; etc.

Chicago Screw Co., 2701 Washington Blvd., Bellwood, Ill.

Chicago Standard Transformer Corp., Addison & Elston, Chicago 18, Ill.
Instrument and power transformers

Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago 7, Ill.

Chicago Thrift-Etching Corp., 1555 N. Sheffield Ave., Chicago 22, Ill.
Etched and lithographed nameplates; dials; scales and panels

Christie Electric Corp., 3401 West 67th St., P. O. Box 19665, Los Angeles 43, Calif.
Dc power supplies; rectifiers; battery chargers and testers

Ciba Co., Inc., 631 Greenwich, New York 14, N. Y.

Cinch Manufacturing Co., 1026 S. Homan Ave., Chicago 24, Ill.

Cincinnati Clock & Instrument Co., 1060 Hulbert St., Cincinnati 14, Ohio
Circuit breaker analyzers

Cincinnati Sub Zero Products, 3930 Reading Rd., Cincinnati 29, Ohio
Temperature and altitude cabinets

Cincinnati Time Recorder Co., 1733 Central Ave., Cincinnati 14, Ohio
Time recorders; clocks; program control systems

Cinema Engineering Co., 1100 Chestnut St., Burbank, Calif.
Ceramic bobbin and encapsulated types wire-wound resistors; decade resistance boxes; instrument switches; rotary tap controls

Circle Gauge Co., P. O. Box 2524, Hollywood 28, Calif.
Piston ring gages

Circle Seal Products Co., Inc., 2181 E. Foothill Blvd., Pasadena 8, Calif.
Precision check valves; relief valves, and manual shut-off valves

Circo Equipment Co., 51 Terminal Ave., Clark (Rahway), N. J.
Ultrasonic and detergent cleaning machines

Circon Component Co., Santa Barbara Municipal Airport, Goleta, Calif.
Electrical connectors; indicating lamp assemblies; precision miniature hardware: instrument screws, nuts, eyelets, rivets, flat and lock washers
(See advertisement on page 85)

Circuit Instruments Inc., 1927 First Ave., S., St. Petersburg, Fla.
Precision wire-wound, single, multiturn, linear and non-linear potentiometers.

Circular Tool Co., Inc., 763 Allen Ave., Providence 5, R. I.

Cities Service Oil Co., 54 Wall St., New York 5, N. Y.
Automotive and aviation service instruments

Clairex Corp., 50 W. 26th St., New York 10, N. Y.
Photoconductive-type photocells

Clare & Co., C. P., 3101 Pratt Blvd., Chicago 45, Ill.
Relays; electric counters and electric mechanical specialties

Clark Co., Geo. P., 150 Canal St., Windsor Locks, Conn.

Clark Controller Co., 1146 E. 152nd St., Cleveland 10, Ohio
Machine tool control systems

Clark Instrument Inc., 10200 Ford Road, Dearborn, Mich.

Clark Mfrg. Co., 1830 E. 38th St., Cleveland 14, Ohio
Torque-measuring equipment; dynamometers; magnetic-particle clutches

Clark & Sons, Inc., Alvan, 58 Day St., West Somerville, Mass.
Optical and astronomical instruments

Clarostat Mfg. Co., Inc., Washington St., Dover, N. H.
Resistors

Clary Corp., 408 Junipero St., San Gabriel, Calif.
Computers; readout machines; computer components; printers; recorders; tape punch equipment

Clebar Watch Co., 15 W. 44th St., New York 36, N. Y.
Stop watches; timers and chronographs

Cleveland Fuel Equipment Co., 1111 Brookpark Rd., Cleveland 9, Ohio
Furnace controllers; pyrometers and gages

Cleveland Instrument Co., Inc., 735 Carnegie Ave., Cleveland 15, Ohio
Precision measuring instruments

Cleveland Metal Specialties Co., 1753 E. 21st St., Cleveland 14, Ohio
Printed circuits and allied components

Cleveland Process Co., 1967 E. 57th St., Cleveland 5, Ohio
Heating elements, infrared sources; thermowells

Cleveland Tungsten, Inc., 10200 Meech Ave., Cleveland 5, Ohio

Cleveland Wire Spring Co., 1281 E. 38th St., Cleveland 14, Ohio

Clevite Research Center, 540 East 105th St., Cleveland 8, Ohio
Industrial and laboratory instrumentation and components; magnetic recorders and memory devices; digital computers

Clifford Mfg. Co., Div., Standard-Thomson Corp., 152 Grove St., Waltham 54, Mass.
Metallic bellows and diaphragms; thermostatic assemblies; packless valves

Clifton Precision Products Co., Inc., Broadway & Maple Ave., Clifton Heights, Pa.
Synchros; instrument motors; servomotors; navigational computers
(See advertisement on pages 206-207)

Climax Controls Div., see Black, Sivalls and Bryson, Inc.

Clippard Instrument Laboratory, Inc., 7390 Colorain Ave., Cincinnati 14, Ohio
Electronic apparatus and electric instruments

Clough-Brengle Co., 6014 Broadway, Chicago 40, Ill.
Electrical instruments, communication testing instruments

Coaxial Connector Co., 37 N. 2nd Ave., Mt. Vernon, N. Y.
Coaxial RF connectors; cable and harness assemblies; microwave components; radar and aircraft antennae; end seals; miniature connectors; electronic subassemblies

Cobehn, Inc., Passaic Ave., Caldwell, N. J.
Equipment and solvents for cleaning instruments and precision components
(See advertisement on page 83)

Cobon Plastics Corp., 41 Lafayette St., Newark 2, N. J.

Cohn Corp., Sigmund, 121 So. Columbus Ave., Mt. Vernon, N. Y.
Galvanometer suspension ribbon
(See advertisement on page 243)

Coil Winding Equipment Co., 19 Maxwell Avenue, Oyster Bay, N. Y.
Coil winding equipment; wire tension devices

Cole Co., H., 82 North High St., Columbus 15, Ohio
Surveying instruments

Coleman Engineering Co., Inc., 6040 W. Jefferson Blvd., Los Angeles 16, Calif.
Centrifuges; analog-to-digital converters; digital readout systems; data reduction machines; oscillogram and ballistics film readers
(See advertisement on page 94)

Coleman Instrument Co., 716 So. Troost Ave., Tulsa 10, Okla.
Oscillographs

Coleman Instruments, Inc., 318 Madison St., Maywood, Ill.
Electrical measuring instruments for technical applications

Colin Campbell Co., Inc., Westville Ave., Ext., Danbury, Conn.
Transformers for electronics, including hermetically sealed, encapsulated, Fosterite impregnated, toroidal and miniature—to customer specifications, commercial or military application

Collectron Corp., 216 E. 45th Street, New York 17, N. Y.
(See advertisement on page 196)

Collins Microflat Co., 2326 E. 8th St., Los Angeles 21, Calif.
Surface plates

Collins Radio Co., Cedar Rapids, Iowa
Electronic apparatus

Color Television, Inc., 973 San Carlos Ave., San Carlos, Calif.
Automatic production circuit testers; sweep VSWR measuring systems; antenna-pattern equipment; flight and altitude simulators

Colortone Electronics Inc., 100 Frank Road, Hicksville, L. I., N. Y. (14)
Annunciators; electronic hardware; components

Columbia Electric Mfg. Co., 4519 Hamilton Ave., N. E., Cleveland 14, Ohio
Rheostats; instruments; shunts; switchboards and special electrical equipment; motor generator sets; synchronous motors

Columbia Technical Corp., 61-02 31st Ave., Woodside 77, N. Y.
Testing equipment for motors, windings, coils, etc.

Colvin Laboratories, Inc., 364 Glenwood Ave., East Orange, N. J.
Pressure displacement and acceleration pickups; voltage-dividing resistors; components
(See advertisement on page 257)

Comar Electric Co., 3349 W. Addison St., Chicago 18, Ill.
Relays; solenoids; switches

Combustion Control Div., Electronics Corp. of America, 718 Beacon St., Boston 15, Mass.
Combustion controls

Commercial Controls Corp., 1 Leighton Ave., Rochester, N. Y.
Data handling and processing equipment; remote controls

Commercial Iron Works, 2424 Porter St., Los Angeles, Calif.
Swing check, flap and butterfly valves; pipefittings;

plates and tables; orifice fittings and flange unions; leveling saddles; orifice plates
(See advertisement on page 155)

Commercial Optical Manufacturing, Inc., P. O. Box 474, Huntington, W. Va.
Optical components; low-reflection lenses

Commercial Products Div., Aircraft Armaments Co., York Rd., Cockeysville, Md.
Microwave and r-f instruments; Conelrad

Commercial Research Division, George L. Nankervis Co., 15300 Fullerton Ave., Detroit 27, Mich.
Instrumentation for automative, aircraft railway and allied industries

Communication Accessories Co., 110th & 71 Hwy., Hickman Mills, Mo.
Toroidal coil and transformers; filters; amplifiers; components

Communication Measurements Lab., Inc., 350 Leland Ave., Plainfield, N. J.
Testers; rectifiers; voltage regulators; communication measuring equipment

Compar Instrument Co., 455 Douglas Road, Holland, Mich.
Comparators, surface-finish microscopes and testers

Computer Corp. of America, Div. of Bruno-New York Industries Corp., 460 W. 34th St., New York 1, N. Y.
Analog computers; microwave instrumentation; accessories.
"IDA", integro-differential analyzer; electrical and electronic instruments and components

Computer Control Co., Inc., 92 Broad St., Wellesley 57, Mass.
Special purpose computers; data handling systems; electronic control systems.

Computer Engineering Assocs., Inc., 350 N. Halstead St., Pasadena 8, Calif.
General and special purpose direct analogy electric analog computors (DAEAC)

Computer Instruments Corp., 92 Madison Ave., Hempstead, L. I.
Position level and dimensional instrumentation; resistors; components

Computer Measurements Corp., 5457 Cleon Ave., North Hollywood, Calif.
Electronic frequency counters; universal countertimers; time interval meters; preset counters; totalizing counters; flow counters; electronic tachometers; metal detectors

Comtor Co., 83 Rumford Ave., Waltham 54, Mass.
Precision internal and external comparator-type diameter gages

Conant Bros. Co., 427 Riverside Ave., Medford 55, Mass.
Non-lubricated plug valves

Conant Laboratories, 6500 0 St., Lincoln 5, Neb.
Dry disk rectifiers

Conax Corp., 7811 Sheridan Drive, Buffalo 21, N. Y.

Condenser Products Co., 6457 Sheridan, Chicago 26, Ill.

Conduflex Corp., 201 Harrison Place, Brooklyn 37, N. Y.
Flexible conduit; conduit assemblies; fittings and couplings

Conn. Ltd., C.G., Electronics Div., 1101 E. Beardsley Ave., Elkhart, Ind.
Stroboscopes

Conn-Craft Co., 301 Fairlawn Ave., Waterbury, Conn.
Fabricating and engraving of plastic instrument covers; dial faces; identification markers; instruction plates; edge-lighted panels

Connecticut Telephone and Electric Div., Great American Industries, Inc., Meriden, Conn.
Electronic devices

Connelly, Inc., 3154 S. California Ave., Chicago 8, Ill.
Gages and manometers; B T U indicators; H_2S testers

Conoflow Corp., 2100 Arch St., Philadelphia 3, Pa.
Final control elements, including: valves for throttling control and "on-off" service; pneumatic power operators; air regulation equipment
(See advertisement on pages 173, 175, 230, 232)

Conrad, Inc., 141 Jefferson St., Holland, Mich.
Test chambers

C. Ray Corp., 29 W. Apple St., Dayton 2, Ohio

Consolidated Electrodynamics Corp., 300 N. Sierra Madre Villa, Pasadena, Calif.
Equipment for measurement, analysis, process control, data processing, and high vacuum technology

Consolidated Electrodynamics Corp., Rochester Div., 1775 Mt. Read Blvd., Rochester 3, N. Y.
Pressure and vacuum instruments, and control accessories; altitude test chambers

Consolidated Molded Products Co., 309 Cherry St., Scranton 2, Pa.

Consolidated Resistance Co. of America, Inc., 44 Prospect St., Yonkers, N. Y.

Consolidated Vacuum Div.—see Consolidated Electrodynamics, Rochester Div.

Consolidated Wire & Assoc. Cos., 1635 S. Clinton St., Chicago 16, Ill.

Contact, Inc., 236 Main St., Cambridge 42, Mass.

Continental Carbon, Inc., 13900 Lorain Ave., Cleveland 11, Ohio
Standard and special resistors

Continental Connector Corp., 3030 Northern Blvd., Long Island City 1, N. Y.

Continental Die Casting Corp., 9615 Grinnell Ave., Detroit 13, Mich.

Continental Electric Co., 715 Hamilton, Geneva, Ill.
Photoelectric tubes and equipment

Continental Electric Equipment Co., Box 1055, Cincinnati 1, Ohio
Control boards and housings; electrical distribution equipment

Continental Equipment Co., Coraopolis, Pa.
Valves

Continental Foundry & Machine Co., See Copes Vulcan Div.

Continental Screw Co., 459 Mt. Pleasant St., New Bedford, Mass.
Complete line of standard, slotted, Phillips head, sheet metal, thread-cutting and special screws

Control Components Co., 46 Walnut St., Brookline 47, Mass.

Control Components Co., 1 Holden St., Brooklyn 46, Mass.
Servo amplifiers; torque motors; linear motion and velocity transducers

Control Corporation, 718 Central Ave., Minneapolis 14, Minn.
Automatic and remote control equipment

Control Devices, Inc., 8299 Nine Mile Rd., Van Dyke, Mich.
Process-control and dimensional control instrumentation; ballistic instruments

Control Electronics Company, Inc., 1925 New York Ave., Huntington Station, N. Y.
Delay lines

Control Engineering Co., 8900 Alpine Avenue, Detroit 4, Mich.
Process timing and automatic-control devices; inspection and testing instruments; counters

Control Products, Inc., 306 Sussex St., Harrison, N. J.
Thermostatic switches; snap action switches

Control Specialties, Inc., 115 F. Arbor Vitae, Inglewood 1, Calif.
Special purpose automatic control systems for aircraft, missiles, and industrial machines and processes

Controls Co. of America, Soreng Div., 9555 Soreng Ave., Schiller Park, Ill.
Solenoids and relays; remote control equipment

Cook Electric Co., 2700 Southport Ave., Chicago 14, Ill. Research Div., 8100 Monticello Drive, Skokie, Ill.
Electrical control devices; metal bellows; vapor meters; telephone protective and distributing apparatus; aircraft instrumentation; relays; pressure switches

Cook Optical, North Brookfield, Mass.

Cook Research Laboratories, L. H., Box 696, Menlo Park, California
Precision testing instruments for oil industry, oil well cement testing equipment, combustible gas indicators, depth pressure recorders.

Cooley Electric Mfg. Co., 38 S. Shelby St., Indianapolis, 7, Ind.

Cooper Alloy Foundry Co., Bloy St., Hillside 5, N. J.

Cooper Co., Clark, Palmyra, N. J.
Timers; alarms, and controllers

Cooper-Hewitt Electric Co., 720-732 Grand St., Hoboken, N. J.
Ultraviolet and monochromatic light sources; quartz components; optical components

Co-Optical Mfg. Co., 1500 W. 59 St., Chicago 36, Ill.

Coors Porcelain Co., Golden, Colo.
Chemical and scientific porcelain

Cope, Inc., T. J., Third & Walnut Sts., Collegeville, Pa.
Instrument tubing support system; instrument tubing

Copease Corp., 270 Park Ave., New York 17, N. Y.
Photocopying equipment

Copes Vulcan Div., Blaw-Knox Co., 936 W. 26th St., Erie 4, Pa.
Automatic controllers for boilers, desuperheaters, pumps, etc; control valves

Corbett Science Labs., F. W., 3115 Venice Blvd., Los Angeles 19, Calif.
Industrial and medical; ultrasonic equipment; cardiac amplifying and indicating apparatus; graph followers and plotters

Corbin Screw Div., American Hardware Corp., New Britain, Conn. Tachometers and speedometers

Cornell-Dubilier Electric Corp., 333 Hamilton Blvd., So. Plainfield, New Jersey
Mica, dykanol, paper, wet and dry electrolytic capacitors; vibrators; converters; antennas; printed circuitry

Corning Glass Works, P. O. Box 544, Corning, N. Y.
Technical glassware

Cornish Wire Co., Inc., 50 Church St., New York 7, N. Y.

Cosa Corporation, 405 Lexington Ave., New York 17, N. Y.
Dynamometers; gas density meters; balancing machines; components

Counter & Control Corp., 5225 W. Electric Ave., Milwaukee 14, Wis.
Circuit-control pre-set counters with automatic reset
(See advertisement on page 93)

Courtney & Co., 1711 Walnut St., Philadelphia 3, Penna.

Crafts Co., Arthur A., 603 Newbury St., Boston 15, Mass.

Craig Systems, Inc., Danvers, Mass.
Submersion, shock, pressure and vibration-proof transit cases; portable electronic systems such as TACAN ground station, air traffic control centers and communication centers

DESIGN PHILOSOPHY

All products are designed for the best attainable engineering compromise between high performance and low cost quantity manufacture. It is accordingly important that we know, as precisely as the customer is able to determine, the actual operating requirements: the linearity, resolution and repeatability which the instrument must have, and the temperature, vibration, acceleration, shock and other environmental conditions under which it must perform. A small relaxation on a tolerance may be reflected in a large reduction in cost. It is our endeavor to meet each customer's needs with instruments of optimum performance at minimum cost.

Specifications, drawings and other information on our instruments are available on request, and our engineers are always prepared to devise new designs to meet new requirements.

COLVIN LABORATORIES, INC.
364 Glenwood Avenue, East Orange, N. J.

Electro-mechanical instrumentation for aircraft and missiles, and for industry

For more information circle **432** on inquiry card.

Cramer Controls Corp., Centerbrook, Conn.
Interval timers; running time meters; time switches; signal control switches; time delay switches

Crane Co., see Hydro Aire

Crane Packing Co., 1800 Cuyler Ave., Chicago 13, Ill.
Optical flats; monochromatic light sources

Cratex Manufacturing Co., 81 Natoma St., San Francisco 5, Calif.
Rubberized abrasives

Crawford Fitting Co., 884 E. 140 St., Cleveland 10, Ohio
Tubings and fittings
(See advertisement on page 107)

Creative Plastics Corp., Stoneybrook, Long Island, N. Y.

Crescent Engineering & Research Co., 11632 McBean St., El Monde, Calif.
Electrical control systems; flowmeters; liquid level controllers; pressure controllers; torque control equipment

Crescent Insulated Wire & Cable Co., 502 Taylor St., Trenton 5, N. J.
Single and "cabled" air and hydraulic tubing
(See advertisement on page 228)

Croname, Inc., 3701 Ravenswood Ave., Chicago 13, Ill.

Crosby Co., 183 Pratt St., Buffalo 5, N. Y.

Crosby Steam Gage & Valve Co., 43 Kendrick St., Wrentham, Mass.
Safety and relief valves; gages; recorders; testers, and steam engine indicators

Crow Electri-Craft Corp., Div. of Universal Scientific Inc., 1102 Shelby St., Vincennes, Ind.

Crowell Mfg. Co., 319 Franklin Ave., Brooklyn 5, N. Y.

Crown Industrial Products Co., 713 Amsterdam St., Woodstock, Ill.
Electric Motor repair equipment; color code paints; design layout inks; rust inhibitors

Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Non-corrosive tubing; permanent magnets

Crystal Glass Tube and Cylinder Co., 7318 So. Chicago Ave., Chicago 19, Ill.
Heat resisting, precision hose and other forms of tubing
(See advertisement on page 191)

Crystal Research Labs., Inc., 29 Allyn St., Hartford 3, Conn.
Capacitors; quartz products; filters; flats; frequency meters; signal generators; mirrors; oscillators; r-f. oscillators; vitreous silica; time interval apparatus; vibration pickups

Cumberland Optical Co., 8422 Georgia Ave., Silver Spring, Md.

Cuno Engineering Co., 80 So. Vine St., Meriden, Conn.
Filters for air, gases and liquids

Curtin & Co., W. H., P. O. Box 118, Houston, Tex.
Laboratory supplies

Curtis Development & Mfg. Co., 3242 North 33rd St., Milwaukee 16, Wis.
Thermostats; terminal blocks; electrical & mechanical control equipment

Curtis Laboratories Inc., 2718 Griffith Park Blvd., Los Angeles 27, Calif.
Optical and photographic equipment; research and development at specialized optical systems for photo-recording, viewing, sighting and finding applications
(See advertisement on page 154)

Curtiss-Wright Corp., Electronics Div., 631 Central Ave., Carlstadt, N. J.
Thickness measurement and control systems

Custom Lubricant Company, 743 Dwight Way, Berkeley 10, Calif.
Instrument lubricants; special oils

Custom Scientific Instruments, Inc., 541 Devon Street, Kearny, N. J.
Testing machines for flooring, textiles, etc.; microtomes; extensometers; thickness gages

Cuthbert Co., Inc., 502 Thorpe Bldg., Minneapolis, Minn.
Scientific grain, seed and food testing equipment

Cutler-Hammer, Inc., P.O. Box 463-464, Milwaukee 1, Wis.
Electric motor control; safety switches; motor driven valve operators; gas calorimeters; gas mixing and stabilizing control, resistors

Cybertronic Corp. of America, 134-8th St., Upland, Chester, Pa.
Automatic controls systems and components

Cyclohm Div., Howard Industries, 1760 State St., Racine, Wis.
Fractional-horsepower motors

Cyclone Motor Corp., 5-17 46th Rd., Long Island City 1, N. Y.

Cyclotron Specialties Co., Moraga 6, Calif.
Radioactivity equipment

D

D & R Limited, 402 Gutierrez St., Santa Barbara, Calif.
Tachometers; h.f. and motor alternators; electronic test equipment

Daco Machine & Tool Co., 202 Tillary St., Brooklyn, N. Y.
Aviation and military instruments

Dage Electric Co., Inc., 67 N. 2nd Street, Beech Grove, Ind.
Accelerometers; connectors.

Dage Television Div., Thompson Products Inc., W. 10th St., Michigan City, Ind.
TV cameras; components

Dahl Co., Inc., George W., 430 High St., Bristol, R. I.
Valves: standard or specially engineered, diaphragm operated, on-off, throttling, packless, manifolded; flangeless pipe-tube connectors; Teflon products consistent with miniaturization
(See advertisement on page 233)

Daigger & Co., A., 159 W. Kinzie St., Chicago 10, Ill.
Laboratory supplies

Dale Instruments Div., Electronic Development Co., 2002 N. 51st St., Omaha 4, Neb.
Electrical instruments

Dale Products, Inc., Box 136, Columbus, Nebr.
Standard resistors; production resistors; potentiometers; instrument dials and pointers; electronic assemblies

Dalmotor Co., 1375 Clay St., Santa Clara, Calif.
Motors; servomotors

Danbury-Knudsen, Inc., Danbury, Conn.

Daniel Orifice Fitting Co., Inc., 3346 Union Pacific Ave., Los Angeles 23, Calif.
Orifice flowmeters and fittings; piston controlled check valves

Daniels, Inc., C. R., Daniels, Md.

Dano Electric Co., Box 709, Winsted, Conn.

Darley & Co., W. S., 2810 Washington Blvd., Chicago 12, Ill.
Pipe locators

Datran Engineering Corp., 3613 Aviation Blvd., Manhattan Beach, Calif.
Aircraft and industrial-process instrumentation; telemetering systems

Daven Co., 530 W. Mt. Pleasant Ave., Route 10, Livingston, N. J. Attenuators; calibrating equipment for electrical instruments; resistors; potentiometers; switches

Davenport Manufacturing Co., 1713 N. Ashland Ave., Chicago 22, Ill. Electronic and electrical test equipment

Davidson Associates, 730 Fifth Ave., New York 19, N. Y. Centrifuges; balances; laboratory apparatus

Davidson Mfg. Co., 2223 Ramona Blvd., W. Covina, Calif. Precision optical testing instruments; auto-collimeters; interferometers; precision divided circles; large optics

Davies Labs., Inc., 4705 Queensbury Rd., Riverdale, Md. Automatic wave analyzer equipment; magnetic data recording and playback equipment

Davis Electric Co., 28 Parker St., Wallingford, Conn.
Wire and cable equipment for insulated wire manufacturers; predetermined counters; spark testers

Davis Instruments Div., Davis Emergency Equipment Co., Inc., 47 Halleck St., Newark 4, N. J.
Portable and continuous gas analysis instruments for safe-guarding life, property and process
(See advertisement on page 116)

Davis Regulator Co., 2541 S. Washtenaw Ave., Chicago 8, Ill.
Valves

Daystrom, Inc., 200 Elmora Ave., Elizabeth, N. J.

Daystrom Instrument Div., Archbald, Pa.

Daystrom Pacific Corp., 3030 Nebraska Ave., Santa Monica, Calif.
Subminiature, miniature and airframe floated rate, direction, and vertical gyros; accelerometers; intervalometers; program timers; inverters; power supplies; related guidance and control equipment
(See advertisement on page 59)

Dayton Instrument, Inc., 404 Winston Ave., Dayton 3, Ohio
Analog to digital converters, pressure transducers

Daytronic Corp., 216 S. Main St., Dayton 2, Ohio
Industrial-process and dimensional control systems and components; scales; testing equipment

Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
Chromium plated gage blocks

Dearborn Glass Co., 6600 S. Harlem Ave., Bedford Park, Ill.

Dearborn Scientific Co., 1228 W. Kinzie St., Chicago 22, Ill.
Optical flats

Decker Aviation Corp., 1361 Frankford Ave., Philadelphia 25, Pa.
Dimensional, electrical and radar instrumentation

DeJur-Amsco Corp., Northern Blvd. at 45th St., Long Island City 1, N. Y.
Photoelectric exposure meters, electrical, radio and photographic products

Del Electronics Co., 41 N. McQuesten Pkwy., Mt. Vernon, N. Y.
High voltage, high quality transformers; specialty transformers; saturable reactors; high-voltage power supplies; motor control apparatus
(See advertisement on page 224)

Delco Appliance Div., General Motors Corp., 391 Lyell Ave., Rochester, N. Y.

Delmhorst Instrument Co., Cedar St., Boonton, N. J.
Moisture detectors

Deltron, Inc., 2905 N. Leighgow St., Phila. 33, Pa.
Electrical and electronic instruments; titration apparatus; relays; power supplies; control equipment

Deltronic Corp., 1507 Riverside Drive, Los Angeles 31, Calif.
Relays

Deming Indicator Co., 1016 Acorn Dr., Dayton 9, Ohio
Test indicators and dial indicators

DeMornay-Bonardi, Inc., 780 S. Arroyo Parkway, Pasadena, Calif.
Microwave test equipment and components

Denison Engineering Co., 1160 Dublin Rd., Columbus, Ohio
Presses and controls

Denison Mfg. Co., R. B., 102 St. Clair Ave., N. W., Cleveland 13, Ohio
Machine tool limit switches—snap action; one, two, and three isolated circuits, double break; Nema 12 enclosures
(See advertisement on page 203)

Denver Fire Clay Co., P. O. Box 5510, Denver 17, Colo.
Specialized industrial control equipment for power plants and processing industries; laboratory specialties

Derbyshire, Inc., F. W., 157 High St., Waltham 54, Mass.
Instrument lathes; micromills; chucks, etc.

Desco Mfg. Co., 605 E. Walnut St., Pasadena 1, Calif.
Electrical inspection and testing equipment

Design Tool Corp., 80 Washington St., New York 6, N. Y.
Automatic lead formers; benders; straighteners, and tapers

Designers for Industry, 4746 W. Washington Blvd., Los Angeles 16, Calif.
Pressure, vacuum and level gages

Dessau Co., Maurice S., 589 5th Ave., New York, N. Y.

Detect-O-Ray, 2622 N. Halsted St., Chicago 14, Ill.
Photoelectric counters

Detecto Scales, Inc., 540 Park Ave., Brooklyn 5, N. Y.
Scales

Detectolab, Inc., 6544 Sheridan Rd., Chicago 26, Ill.
Radioactivity instrumentation; amplifiers; counters; precision power supplies

De-Tec-Tronic Corporation, 2512 N. Halsted Street, Chicago 14, Ill.
Photoelectric instruments

Detroit Controls Corp., 934 Washington St., Norwood, Mass.

Detroit Testing Machine Co., 9390 Grinnell Ave., Detroit 13, Mich.
Testing machines

Development Engineering Co., 9 Cross St., Norwalk, Conn.
Automatic assembly machines
(See advertisement on page 103)

Development Industries, Box 7053, Cranwood Sta., Cleveland 28, Ohio
Differential-pressure gages

Deutronics, Inc., 221 N. Hermitage Ave., Trenton 8, N. J.

Dexter Machine Products, Inc., Box 328, Chelsea, Mich.
Instrument gears

DeZurik Shower Co., Sartell, Minn.
Consistency regulators; weir-type flowmeters; control valves

Dialight Corp., 60 Stewart Ave., Brooklyn 37, N. Y.
Sub-miniature indicator lights; edge lighting assemblies; pilot light assemblies for neon and incandescent lamps; oil tight, rugged indicator lights
(See advertisement on page 161)

Diamond Instrument Co., North Ave., Wakefield, Mass.

Diamond Mfg. Corp., 7 North Ave., Wakefield, Mass.

Diamond Power Specialty Corp., P. O. Box 415, Lancaster, Ohio
Industrial television; blowers; water gages and columns

Diatron Co., 5411 Pocahontas, Bellaire, Texas
Electrical and electronic instruments

Dice Co., J. W., 16 Highwood Ave., Englewood, N. J.
Electronic micrometers for springs, diaphragms, paper; magnetic inspection devices; metal sorters; flaw detectors, low resistance testers; insulation testers
(See advertisement on page 8)

Dickson Co., 7420 Woodlawn Ave., Chicago 19, Ill.
Furnace controls; chart recorders
Diehl Mfg. Co., Electrical Div. of the Singer Mfg. Co., Finderne Plant, 1116 Finderne Ave., Somerville, N. J.
Fans; motors; servomotors; components

Dietert Co., Harry W., 9330 Roselawn Ave., Detroit 4, Mich.
Laboratory supply house

Dietz Co., Henry G., Coral Designs Division, 12-16 Astoria Blvd., Long Island City 2, N. Y.
Automatic timers; panels; switchgear; manometers; nameplates

Dietz Design and Manufacturing Co., Grandview, Missouri
Inductance components

Dietzgen Co., Eugene, 2325 N. Sheffield Ave., Chicago 14, Ill.
Drafting and surveying instruments

Diffraction Products, Inc., 1400 S. 14th Ave., Maywood, Ill.

Digitac, Inc., 420 S. Beverly Drive, Beverly Hills, Calif.
Electrical impulse counters

Dilectron Div., Gudeman Co. of Calif., 2669 S. Myrtle Ave., Monrovia, Calif.
Delay lines; ceramic capacitors; pulse forming networks; pulse transformers

Dillon & Co., W. C., 14620 Keswick St., Van Nuys, Calif.
Traction dynamometers, tensile machines, thermometers

Dimco-Gray Co., 207 E. 6 St., Dayton 2, Ohio
Timers and switches; plastic knobs and handles

Dinion Coil Co., P. O. Drawer D, Caledonia, N. Y.

Disston Div., Henry, H. K. Porter Co., Inc., Philadelphia 35, Pa.
Tools; tool steel

Disston & Sons, Inc., Henry, Tacony Station, Philadelphia 35, Pa.

Distillation Products Industries, Rochester 3, N. Y.
High vacuum pumps, low vapor pressure fluids and auxiliary equipment

Dit-Mco, Inc., Electronics Div., 911 Broadway, Kansas City, Mo.
Electrical and electronic inspection and testing systems; components; automatic circuit analyzer

Dittmore & Freimuth Co., 2517 E. Norwich Ave., Milwaukee 7, Wisconsin
Electrical instruments, counters; cable splicers

Division Lead Co., 7742 W. 61st Place, Summit, Ill.
Metal & alloy products; solder; solder preforms

Dixon Inc., William, 32-42 E. Kinney St., Newark 1, N. J.
Optical and mechanical micrometers; jeweler's balances and tools; soldering irons; industrial brushes
(See advertisement on page 223)

Dmeter Manufacturing Co., Inc., 22-24 Larkin Plaza, Yonkers 2, N. Y.
Precision wire wound resistors

DoAll Company, 254 N. Laurel, Des Plaines, Ill.
Gages; Brinnell hardness testers; precision tools

Doelcam Div., Minneapolis-Honeywell Regulator Co., 1400 Soldiers Field Rd., Boston 35, Mass.
Precision instruments; gyroscopes; servomechanisms

Doerr Electric Corp., Cedarburg, Wis.

Doerr Glass Co., Inc., N. E. Cor. Peach & Blvd., Vineland, N. J.
Chemical glassware

Dole Valve Co., 1901-1941 Carroll Ave., Chicago 12, Ill.

Dolinko & Wilkins, Inc., 1901 Summit Ave., Union City, N. J.

Dollinger Corp., 11 Centre Park, Rochester 3, N. Y.
Instrument air filters

Donner Scientific Co., 2829 Seventh St., Berkeley 10, Calif.
Electrical instruments and automatic-control systems; aircraft instruments; analog computers

Doolittle Radio, Inc., 7421 Loomis Blvd., Chicago 36, Ill.
Frequency monitor

Dorber Co., 7741 W. Palatino Ave., Chicago 31, Ill.
Dissolved oxygen analyzer

Dormeyer Industries, 3418 Milwaukee Ave., Chicago 41, Ill.

Dormitzer Electric & Manufacturing Co., Inc., 50 Hadley St., Cambridge, Mass.
Electrical instruments; speed control systems; light sources; relays; intercoms; electronic components

Dorr-Patterson Engineering Co., 241 Chene, Detroit 7, Mich.
Physical testing machines

Douglas Instrument Labs., 176 Norfolk Ave., Boston 19, Mass.
Electrical and electronic instruments

Douglass Automatic Controls Co., 5949 Clara St., Bell Gardens, Calif.
Boiler controls

Douthitt Corp., 650 W. Baltimore Ave., Detroit 2, Mich.
Process cameras and diaphragm control for cameras

Dow Chemical Co., Building 249E, Midland, Mich.

Dow-Corning Corp., P. O. Box 592, Midland, Mich.
Silicone fluids and greases for high and low temperature lubrication of instruments; stop-cock grease; high vacuum grease; lens cement; liquid dielectrics; diffusion pump oils

Drafte Co., Cochranton, Pa.
Drafting machines

Drage Products, 406-32nd St., Union City, N. J.
Viscosity measurement and automatic-control equipment; cryptometers; laboratory baths

Dragon Engineering Co., 5817 S. Central Ave., Los Angeles 11, Calif.
High pressure needle valves; regular and panel mounting globe valves; gage glass fittings; swage nipples; pipe fittings
(See advertisement on page 235)

Drake Manufacturing Co., 1713 W. Hubbard St., Chicago 22, Ill.
Dial & signal lights

Draper Mfg. Co., 319 Church St., New York 13, N. Y.
Temperature and humidity instrumentation

Dressen-Barnes Corp., 250 N. Vinedo Ave., Pasadena 8, Calif.
Regulated dc power supplies; magnetic amplifiers

Driaire, Inc., 132 S. Main St., South Norwalk, Conn.
Humidity and dehydration instruments and specialties

Driver Co., Wilbur B., 150 Riverside Ave., Newark 4, N. J.

Driver-Harris Co., P. O. Drawer 31, Harrison, N. J.

Drying Systems, Inc., 1800 Foster Ave., Chicago 40, Ill.

Du-Co Ceramics Co., Box 587, Butler, Pa.
Pyrometer tubes; insulators; ceramic materials

Ducommun Co., M., 580 Fifth Ave., New York 36, N. Y.
Coil-spring stopwatches

DuMont-Airplane & Marine Instruments, Inc., 15 William St., New York 5, N. Y.

DuMont Labs., Inc., Allen B., 750 Bloomfield Ave., Clifton, N. J.
Cathode-ray oscillographs; cathode-ray tubes. associated electronic equipment; television control; studio transmitting equipment; multiplier phototubes, signal generators

Dunbar Glass Corp., Dunbar, W. Va.

Duncan Electric Mfg. Co., Lafayette, Ind.
Ac and dc watthour meters; service and switchboard types; portable test meters, appliance meters and instrument transformers

Dunlee Corp., 4558 W. Congress St., Chicago 24, Ill.
X-ray tubes

Duotone Co., Inc., Locust St., Keyport, N. J.

Duplex Clock Co., Inc., 29 Cherry Ave., Waterbury, Conn.

DuPont de Nemours & Co., E. I., N. W. Corner 10th & Market Sts., Wilmington 98, Del.
Fluorescent screens and chemicals

Durakool, Inc., 1010 N. Main St., Elkhart, Ind.
Mercury switches

Duraloy Co., Scottdale, Pa.

Durant Manufacturing Co., 1925-1929 N. Buffum St., Milwaukee 1, Wis.
Counting and measuring machines with stroke and rotary counters; lineal measuring units; predetermined, electric counters
(See advertisement on page 92)

Durez Plastics Div., Hooker Electromechanical Co., Niagara Falls, N. Y.

Dusenbury, John, 150 Pine St., Montclair, N. J.
Designers and builders of nautical instruments, and special mechanical devices

Dwyer Mfg. Co., F. W., P. O. Box 373, Michigan City, Ind.
Air velocity meters; inclined tube and vertical monometers; flowmeters, pitot tubes; combustion test sets; pressure switches, and related instruments
(See advertisement on pages 99, 144)

Dyna-Empire, Inc., 1075 Stewart Ave., Garden City, L. I., N. Y.
Earphones; microphones; electronic components; jet engine parts; hydromechanical devices
(See advertisement on page 140)

Dynalysis Development Laboratories, Inc., 11941 Wilshire Blvd., Los Angeles 25, Calif.
High precision computing, instrumentation equipment

Dynamatic Div., Eaton Mfg. Co., 3307 14th Ave., Kenosha, Wis.
Variable speed drives, torque measuring equipment

Dynamic Gear Co., Inc., 20 Merrick Rd., Amityville, L. I., N. Y.
Fine-pitch instrument gears

Dynamic Instrument Co., 28 Carleton St., Cambridge 42, Mass.
Pressure, force, load and strain instrumentation

E

E-C Apparatus Co., 23 Haven Ave., New York 32, N. Y.
Electroconvection apparatus; countercurrent extractors; electrophoresis paper; power supplies

E & S Optical Co., 1426-28 Willow Ave., Hoboken, N. J.
Optical components

E S C Corporation, 534 Bergen Blvd., Palisades Park, N. J.
Delay lines; pulse transformers; radio noise filters

E-T-A Products Co. of America, 5-85 N. Elston Ave., Chicago 30, Ill.
Miniature circuit breakers; starter winding relays; temperature sensitive and time delay relays; overload relays

E&W Optical Co., 2406 E. Hennepin Ave., Minneapolis 14, Minn.
Dimensional gaging equipment; optical instruments and components

Eagle Signal Corp., 202 20th St., Moline, Ill.
Industrial control devices; traffic signal controllers and sign flashers

Eastern Aircraft Products Corp., Orange, N. J.
Self sealing, zero leakage, quick disconnect valves

Eastern Air Devices, Inc., 385 Central Ave., Dover, N. H.
Fraction-hp motors; synchronous motors

Eastern Etching & Mfg. Co., Grape and Front Sts., Chicopee, Mass.

Eastern Industries, Inc., 100 Skiff St., Hamden 14, Conn.
Traffic signaling devices. hydraulic pumps; hydraulic servomotors

Eastern Precision Resistor Corp., 675 Barbey St., Brooklyn 7, N. Y.
Decade boxes; heat flow instrumentation

Eastern Science Supply Co., 7-9 High St., Brookline, Mass.
Meteorological instruments

Eastern Specialty Co., 3617 N. 8th St., Philadelphia 40, Pa.
Testing equipment for checking and maintenance of watthour meters, demand instruments, etc. Special apparatus for load survey work.
(See advertisement on page 160)

Eastman Kodak Co., 343 State St., Rochester 4, N. Y.
Photographic equipment for laboratories, spectrographic, X-ray, etc.

Eastman Oil Well Survey Co., P. O. Box 408, Long Beach 1, Calif.
Underground surveying equipment

Eaton-Dikeman Co., Mt. Holly Springs, Pa.
Laboratory apparatus

Eaton Manufacturing Co., Reliance Div., 25 Charles Ave., S.E., Massilon, Ohio

Eberbach & Son Co., 200 E. Liberty St., Ann Arbor, Mich.
Laboratory apparatus

Ebert Electronics Corp., 212-26 Jamaica Ave., Queens Village 28, L. I., N. Y.
(See advertisement on page 188)

Eby, Inc., Hugh H., 4700 Stenton Ave., Philadelphia 44, Pa.
Relays and radio parts

Eckert-Mauchly Div. Remington Rand Inc., 2300 W. Allegheny Ave., Philadelphia 23, Pa.
Computers

Eclipse Fuel Engineering Co., 1100 Buchanan St., Rockford, Ill.
Furnaces, boilers and their automatic ocontrols; valves; accessories

Eclipse Glass Co., Inc., Box 191, Thomaston, Conn.

Eclipse-Pioneer Div., See Bendix Aviation Corp.

Eco Engineering Co., 12 New York Ave., Newark 1, N. J.
Corrosion-resistant pumps

Edcliff Instruments, 1711 So. Mountain Ave., Duante, Calif.
Precision linear potentiometers; linear accelerometers; angle of attack-yaw meters; pendulum position indicators; precision potentiometer test equipment
(See advertisement on page 210)

Eder Instrument Co., 2293 N. Clybourn Ave., Chicago 14, Ill.
Inspection devices for internal inspection: transformer or battery powered lights; inspection rods; internal Inspectroscopes (rigid, flexible); magnifiers; mirrors; pocket microscopes
(See advertisement on page 211)

Edelmann & Co., E., 2332 Logan Blvd., Chicago 47, Ill.
Automotive test instruments

Edgerton, Germeshausen & Grier, Inc., 160 Brookline Ave., Boston 15, Mass.
Research-type cameras; xenon discharge tubes; oceanographic instruments

Edin Co., Inc., 207 Main St., Worcester 8, Mass.
Oscillographs, amplifiers, recorders, galvanometers

Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
Temperature monitoring systems for aircraft and industry; aircraft instruments: temperature indicators, pressure indicating and telemetering systems; thermal and sensitive relays; sealed thermostats
(See advertisement on page 186)

Edmund Scientific Corp., 101 E. Gloucester Pike, Barrington, N. J.
Telescopes; microscopes; spectroscopes; optical components

Edna Lite Optical Co., Inc., 200 N. Water St., Peekskill, N. Y.

Edroy Products Co., 480 Lexington Avenue, New York 17, N. Y.
Magnifying products

Edwards, L. V., 32 Irving Place, Rockville Centre, N. Y.
Smoke-density instruments and alarms

Edward Valves, Inc., 1200 W. 145th St., E. Chicago, Ind.
Control valves

EECO Production Co., see Engineered Electronics Co.

Eichner Instruments, L. C., 19 Sebargo St., Clifton, N. J.

Eicor, Inc., 4235 W. North Ave., Chicago 39, Ill.
Fractional hp., geared, ungeared, synchronous, capacitor, and dc motors

Eisele & Co., 400 First Ave., N. Nashville 3, Tenn.

Eitel-McCullough, Inc., San Bruno, Calif.
Electrical and electronic instruments, and components

Eitzen Co., Louis C., 17 W. 60th St., New York 23, N. Y.
Extensometers

El Dorado Electronics Co., 4926 E. 12th St., Oakland, Calif.
Audio amplifiers; tuners

El Mec Labs., 730 Boulevard, Kenilworth, N. J.
Process timers

El Products Corp., P. O. Box 41, Kingsbridge Station, New York 63, N. Y.
Mechanical and battery-operated clock movements; chart drives
(See advertisement on page 150)

El Ray Motor Co., 11747 Vose St., N. Hollywood, Calif.
Miniature and fractional-hp and related assemblies, including gear trains and filters; generators, inverters, and servomotors

El-Tronics, Inc., 437 N. 5th St., Philadelphia 6. Pa.
Nuclear and electronic instrumentation; radioactivity standards and supplies

Eldema Corp., 9844 Remer St., El Monte, Calif.
Neon and incandescent miniature indicator lights; plug-in-circuit containers; electronic engineering and development
(See advertisement on page 162)

Electomic Mechanisms, Inc., 567 Old Post Rd., Cos Cob, Conn.
Powdered iron clutches brakes; electromechanical amplifiers; torque controls

Electric Auto-Lite Co., Industrial Thermometer Div., Toledo 1, Ohio
Pressure and vacuum gages; speedometers; tachometers and thermometers
(See advertisement on page 54)

Electric Design & Mfg. Co., P. O. Box 237, Burlington, Iowa
Electrical indicating instruments

Electric Eye Equipment Co., 1938 E. Fairchild St., Danville, Ill.
Automatic inspection devices

Elect. Heat Control Apparatus Co., 507 Fifth Ave., Room 1066, New York 17, N. Y.
Laboratory ovens

Electric Hotpack Co. Inc., Melrose St. at Cottman Ave., Philadelphia 35, Pa.
Designers and manufacturers of controlled temperature equipment; ovens; furnaces; sterilizers; baths; constant temperature rooms for laboratories, pilot plants and plants
(See advertisement on page 157)

Electric Indicator Co., Camp Ave., Springdale, Conn.
Synchronous motors; position indicators; level controls; signaling devices

Electric Regulator Corp., Pearl St., Norwalk, Conn.
Current and frequency regulators

Electric Soldering Iron Co., Deep River, Conn.
Soldering irons, guns; solder pots

Electric Sorting Machine Div., Mandrel Industries, Inc., 3550 Eastern Ave., S.E., Grand Rapids 8, Mich.
Photoelectric equipment; automatic inspection equipment

Electric Specialty Co., 175 South St., Stamford, Conn.

Electric Speed Indicator Co., 12234 Triskett Road, Cleveland 11, Ohio
Precision electric tachometers and remote position indicators; windspeed and direction instruments

Electric Switch Corp., 1302 E. 11th St., Columbus, Ind.

Electric Tachometer Corp., 68th and Opland Sts., Philadelphia 42, Pa.
Speed indicators and recorders; electric and mechanical counters

Electrical Industries, Inc., 44 Summer Avenue, Newark 4, N. J.
Glass to metal seals

Electrical and Physical Instrument Corp., 25 W. 43rd St., New York 36, N. Y.
Square pulse generators; wideband amplifiers; counters; pulse transmission equipment

Electrical Utilities Co., 2429 St. Vincent Ave., La Salle, Ill.

Electricoil Transformer Co., Westerly Rd., Ossining, N. Y.

Electrimatic Div., Marsh Corp., J. P., 3501 Howard St., Skokie, Ill.
Automatic control valves and controls; regulating valves—pressure, temperature, and electrical actuation

Electro-Chemical Engraving Co., Inc., 1100 Brook Ave., New York 56, N. Y.

ElectroData Div., 460 Sierra Madre Villa, Pasadena, Calif.
Electronic data processing systems; general purpose digital computers; magnetic tape systems; punched card systems; paper tape input/output systems

Electro Development Co., 14701 Keswick St., Van Nuys, Calif.
Sub-miniature rotary switches 1 to 3 pole, 2 to 4 gangs; slip rings, slip ring and brush assemblies; plastic products
(See advertisement on page 196)

Electro Development Corp., 6006 W. Washington Blvd., Culver City, Calif.

Electro Devices, Inc., 4025 Easton Ave., St. Louis 13, Mo.
Electrical and electronic instruments; speed control; tension control; accessories

Electro Engineering Products Co., Inc., 609 West Lake St., Chicago 6, Ill.
Instrument and servomechanism motors; signal generators, h-f apparatus

Electro Instruments, 3796 Rosecrans St., San Diego 10, Calif.

Electro Measurements, Inc., 7524 S.W. Macadam Ave., Portland 1, Oregon
L-R-C comparison bridges; capacitance bridges. precision voltage dividers; resistance decades; capacitance decades

Electro-Mec Laboratory, Inc., 47-51 33rd St., Long Island City 1, N. Y.
Precision potentiometers

Electro Mechanical Div., General Riveters, Inc., 785 Hertel Ave., Buffalo 7, N. Y.
Hysteresis, fluid-magnetic, and electrically actuated friction clutches

Electro-Mechanical Instrument Co., 812 Chestnut St., Perkasie, Pa.
Electrical instruments

Electro Mechanical Specialties Co., Inc., 1016 N. Highland Ave., Angeles 38, Calif.
Balanced armature relays, vibration resistant, for use in airborne, missile, radar and communication applications

Electro-Mechanical Research, Inc., 64 Main St., Ridgefield, Conn.
Electrical and electronic instruments and components

Electro-Mechano Co., 261 E. Erie St., Milwaukee 2, Wis.
Electric tachometer generators and indicators; ignition tachometers; precision sensitive drilling machines (bench, floor, mounted): variable speed, manual or power feed
(See advertisement on page 208)

Electro-Medical Laboratory, Inc., South Woodstock, Vt.
Neurological and allied medical instruments and general electronic apparatus
(See advertisement on page 78)

Electro-Miniatures Corp., 1060 Elm Ave., Ridgefield, N. J.
Precious metal and alloy slip rings, and brush assemblies

Electro Products Laboratories, 4501 N. Ravenswood Ave., Chicago 40, Ill.
Battery eliminators and rectified ac devices
(See advertisement on page 145)

Electro Pulse, Inc., 11811 Teale Street, Culver City, Calif.
Industrial counters; time interval and frequency meters; pulse generators; magnetic core testing equipment; voltage and current calibrators; time delay and gate generators

Electro-Snap Switch and Mfg. Co., 4218 W. Lake St., Chicago 24, Ill.
Snap action switches

Electro Switch Corp., 167 King Ave., Weymouth 88, Mass.
Switches

Electro Tec. Corp., South Hackensack, N. J.
Slip rings; commutators; brush assemblies; selector switches; miniature relays

Electro-Tech Equipment Co., 308 Canal St., New York 13, N. Y.
Electrical and electronic parts and equipment distributor
(See advertisement on page 102)

Electro-Technical Labs., Div., Mandrel Industries, Inc., 504 Waugh Drive, Houston 19, Texas
Electro magnetic velocity seismometers; reflection-refraction amplifier; magnetic tape recording systems; recording oscillographs

Electro-Voice, Inc., Buchanan, Mich.
Audio equipment; electro-acoustic devices

Electrocon Corp., 219 Sunrise Highway West, Freeport, N. Y.
Vibration measuring instruments

Electromath Corp., 190 Henry St., Stamford, Conn.

Electromotive Mfg. Co., Willimantic, Conn.

Electronic Apparatus Corp., 116 E. Jackson Blvd., Elkhart, Ind.
Mercury relays and switches

Electronic Associates, Inc., Long Branch Ave., Long Branch, N. J.
Aircraft and electrical instruments; analog computers; X-Y recorders; plotting boards; six channel recorders; computation service
(See advertisement on page 55)

Electronic Computer Div., Underwood Corp., 35-10 36th Ave., Long Island City 6, N. Y.

Electronic Control Corporation, 1573 E. Forest Ave., Detroit 7, Mich.
Automatic controllers and timers; relays; photoelectric instruments; amplifiers; thickness gages

Electronic Control Systems, Inc., 2138 Westwood Blvd., Los Angeles, Calif.
Automatic and remote control systems

Electronic Controls, Inc., 4521 Chestnut St., Philadelphia 9, Pa.
Electronic controllers and timers for counting, lighting, etc.

Electronic Designs, Inc., 28 School St., Yonkers, N. Y.
Vacuum-tube voltmeters; precision wire-wound resistors

Electronic Development Lab., 4463 N. Harlem Ave., Chicago 31, Ill.
Electronic Apparatus

Electronic Devices, Inc., 429—12th St., Brooklyn 15, N. Y.

Electronic Engineering Associates, Ltd., 1040 Brittan Ave., San Carlos, Calif.
Dynamic pressure measuring equipment

Electronic Engineering & Services Co., Inc., 104 W. Jefferson St., Falls Church, Va.

Electronic Fabricators, Inc., 682 Broadway, New York City, N. Y.

Electronic Instrument Co., Inc., 84 Withers St., Brooklyn 11, N. Y.
Electrical and electronic instruments
(See advertisement on page 79)

Electronic Mfg. Co., 140 S. Second St., Harrisburg, Pa.
Oscillators, voltmeters

Electronic Measurements Co., Inc., Lewis St. & Maple Ave., Eatontown, N. J.
Ac and dc precision regulators and calibrators

Electronic Measurements Corp., 280 Lafayette St., New York 12, N. Y.
Oscilloscopes; tube testers; radio and TV set analyzers; volt-ohm-milliammeters

Electronic Mechanics, Inc., 70 Clifton Blvd., Clifton, N. J.

Electronic Parts Mfg. Co., Inc., 508-25th St., Union City, N. J.

Electronic Products Co., 111 Third St., Mt. Vernon, N. Y.
Special gas tubes including Geiger counters, corona regulators and light sources

Electronic Products Co., 5330 E. Olympic Blvd., Los Angeles 22, Calif.
Glass instruments and apparatus

Electronic Rectifiers, Inc., 2102 Spann Ave., Indianapolis 3, Ind.
Laboratory and industrial power supplies; rectifiers

Electronic Research Associates, Inc., 67 E. Centre St., Nutley 10, N. J.
Electrical instrumentation; transistor circuits; power supplies

Electronic Specialty Co., 5121 San Fernando Blvd., Los Angeles, Calif.
Miniature relays; time delay relays; missile fuses; under and over-voltage; and under and over-frequency sensors; r-f systems and components; flashers; specialty devices

Electronic Transformer Co., 70 Washington St., Brooklyn 1, N. Y.
Fixed and adjustable transformers

Electronic Tube Corp., 1200 E. Mermaid Lane, Philadelphia, Pa.
Cathode ray oscillographs

Electronics Corp. of America, 77 Broadway, Cambridge 42, Mass.
Industrial photoelectric controls including counting equipment; electronic timers and special electronic controls; smoke controls

Electronics Development Laboratory, 336 National Rd., Dayton 3, Ohio
Catheter manometers; spark light sources

Electron-Radar Prods., 4806 W. Chicago Ave., Chicago 44, Ill.
Vacuum gages; photocells and phototubes; watthour meter testers; alarm systems; bridges; components

Electronics, Inc., 127 Sussex Ave., Newark 3, N. J.
Gas-filled and grid-control rectifier tubes

Electrosig Corp., 239 Main St., Stamford, Conn.
Voltage regulators; automatic timers; transformers; rectifiers; laboratory apparatus; electroplating solution testers

Electrosonic Engineering Co., 2120 Pontius Ave., Los Angeles 25, Calif.
Mercury, sensitive and subminiature relays; antennas

Electyme Motor Products Corp., River Woods Rd., Deerfield, Ill.
Clocks and timers

Electro-Serv. Co., 480 Johnson Ave., Brooklyn 37, N. Y.
Electrical components

Elematic Equipment Corp., 6731 So. Chicago Ave., Chicago 37, Ill.
Pyrometers; flowmeters; thermocouples

Electronics Div., 2435 N. Naomi St., Burbank, Calif.

Elgin National Watch Co., Elgin, Ill.
Relays; microphones; sound powered telephones; audio equipment

Elgin Tool Works Inc., 1770 Berteau at Ravenswood Ave., Chicago 13, Ill.
Precision machine tools; special precision machines; optical machinery

Ellis Associates, Box 77, Pelham, N. Y.
Preamplifiers; strain-time recorders; calibrating equipment
(See advertisement on page 202)

Ellis & Sons Inc., G. D., American & Luzerne Sts., Philadelphia 40, Pa.
Instrument packaging

Ellison Draft Gage Co., 548 W. Monroe St., Chicago 6, Ill.
Manometers; draft gages; calorimeters; furnace control systems; portable gas analyzers; inclinometer tubes; pitot tubes; draft instruments; pitot tubes
(See advertisement on page 99)

Ellwood Ivins Steel Tube Works, Oak Lane, Philadelphia 26, Pa.

Elsbert Mfg. Co., Inc., 910 W. Lake St., Chicago 7, Ill.

Emarco Corp., P. O. Box 615, Far Hills, Sta., Dayton 9, Ohio.
Signaling system and components

Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.
Plastic electro-magnetic energy absorbers; plastic foams; laminating resins; impregnants; dielectric materials

Emerson Apparatus Co., 171 Tremont St., Melrose, Mass.
Calorimeters; material testing equipment

Emery Comany, A. H., Pine St., New Canaan, Conn.
Pressure gages, and testing machines
(See advertisement on page 242)

Emmett Machine & Mfg. Co., 445 E. Turkeyfoot Lake Rd., Akron 19, Ohio
Automatic controllers, timer, and control valves

Empire Devices, Inc., 38-25 Bell Blvd., Bayside, N. Y.
High frequency apparatus

Empire Electronics Co., 409 Ave. L., Brooklyn 30, N. Y.
Electronic equipment distributor

Empire State Labs., 2608 Merrick Rd., Bellmore, L. I., N. Y.
Precision gear and instrument assemblies; mechanical components
(See advertisement on page 102)

Endevco Corp., 161 E. California St., Pasadena, Calif.
Dynamic measuring instrumentation: accelerometers; pressure pickups; force gages with associated electronics for indicating, telemetering and recording

Engelhard, Inc., Charles 850 Passaic Ave., East Newark, N. J.
Industrial instruments

Engineered Electronics Co., 506 E. First St., Santa Ana, Calif.
Packaged circuit plug-in units; dc regulated power supplies; analog computers

Engineered Magnetics, Div. of Gulton Mfg. Corp., 11818 Teale St., Culver City, Calif.
Power supplies; regulators; magnetic amplifiers; frequency controls

Engineering Laboratories, Inc., 610-24 E. 4th St., Tulsa 3, Okla.
Seismic exploration equipment; vibration detectors; petroleum engineering devices; signaling equipment

Engineering & Research Corp., Div. of ACF Industries, Inc., P. O. Box 209, Hyattsville, Md.

Engineering Research & Development Co., Addison, Ill.
Precision instruments—custom built

Engineers Specialty Div., Universal Engraving & Colorplate Co., 980 Elliott St., Buffalo 9, N. Y.
Optical comparators

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Microscopes; surveying instruments; photoelectric color analyzers; optical flats and components; abrasive compounds

Engler Instrument Co., 250 Culver Ave., Jersey City 5, N. J.
Time registers, controllers and recorders; hub odometers; airspeed indicators

Enley Products, Inc., 1236 Broadway, Brooklyn 21, N. Y.
Demineralizers, ion exchange resins.

Enteco Industries, Inc., 610 Kosciusko St., Brooklyn 21, N. Y.

Environmental Equipment Co., 369 Linden St., Brooklyn, N. Y.
Testing equipment
(See advertisement on page 103)

Epic Inc., 154 Nassau St., New York 38, N. Y.
Electrical instruments; vibration and temperature instruments; optical equipment

Eppley Laboratory Inc., 12 Sheffield Ave., Newport, R. I.
Standard cells; thermopiles, pyrheliometers; golay infrared detectors; precision dc measuring instruments
(See advertisement on Inside Front Cover & page 201)

Epsco, Inc., 588 Commonwealth Ave., Boston 15, Mass.
Electrical and electronic instruments; flight test instruments; digital computing equipment

Eraser Co., Inc., 1060 S. Clinton St., Syracuse 4, N. Y.

Erb & Gray, 854 S. Figueroa St., Los Angeles 17, Calif.
Toolmaker's microscopes; laboratory supply house

Erdco Engineering Corp., Westgate Dr. and Official Rd., Addison, Ill.

Industrial dielectric heating equipment; motor speed controls; capacitance and inductance testers; tachometers; electrical, hydraulic and pneumatic test instruments; r-f power line filters

Ercona Corp., 551 Fifth Ave., New York 17, N. Y.
Mechanical and optical toolroom and gage-lab equipment

Erickson Specialty Co., 10 Cayuga St., P. O. Box 141, Cohoes, N. Y.
Solenoid valves

Ericsson Screw Machine Products Co., 25 Lafayette St., Brooklyn 1, N. Y.

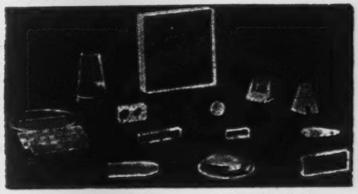
Erie Resistor Corp., 644 West 12th St., Erie, Pa.
High frequency and molded resistors; capacitors

Eriez Mfg. Co., 1945 Grove Dr., Erie, Pa.
Permanent magnets

Erwood, Inc., 1770 Berteau St., Chicago 13, Ill.
Sound and vibration instrumentation

Esco Products Co., Oak Ridge Rd., Oak Ridge, N. J.
Dimensional gages and inspection equipment; optical instruments and components; light sources
(See advertisement on page 261)

TRANSPARENT FUSED QUARTZ
OPTICALLY GROUND & POLISHED



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- **High temperature heat resistant**
- **Rectangles, odd shapes holes drilled, tolerances maintained**
- **High acid resistant**

Send Spec. of your problems

ESCO PRODUCTS
Oak Ridge Rd., Oak Ridge, N. J.
Formerly E. & S. Optical Co.
Dept. IFQ

For more information circle **433** on inquiry card.

Ess Instrument Co., 96 S. Washington Ave., Bergenfield, N. J.
Industrial electronic instruments: photoelectric for smoke, flame, turbidity, color; specific gravity indicators, recorders, and controllers

Essex Wire Corp., 1600 Wells Street, Fort Wayne, Ind.

Esterline-Angus Co., Inc., P. O. Box 596, Indianapolis 6, Ind.
Graphic recording and contact-making electrical instruments; time, speed, pressure, and vacuum recorders; portable current transformers

Eureka Manufacturing Co., 144 Britannia St., Taunton, Mass.

Eureka X-ray Tube Corp., 3240-58 N. Kilpatrick Ave., Chicago 41, Ill.
X-ray tubes

Evaporated Metal Films Corp., 147 E. State St., Ithaca, N. Y.
Mirrors, beam splitters
(See advertisement on page 148)

Ever Ready Thermometer Co., 88 Park Pl., New York 7, N. Y.
Calorimeters; thermometers

Everett Products, Inc., 50 Aleppo St., Providence, R. I.
Recording pens; electronic components; glass tubing

Everson Mfg. Co., 214 W. Huron St., Chicago 10, Ill.
Chemical feeders

Ewald Instruments, 93 Nassau St., New York 38, N. Y.
Welding equipment—tap welding
(See advertisement on page 243)

Exact Weight Scale Co., 944 West 5th Ave., Columbus 8, Ohio
Over-and-under weight scales and indicators for industrial purposes

Ex-Cell-O Corp., 1202 Oakman Blvd., Detroit 32, Mich.
High precision machine tools; threading and tapping tools

Excel Electric Service Co., 2113 S. Western Ave., Chicago 8, Ill.
Ground detectors; capacity relays

Excellex Electronics, Inc., 475 Chestnut Street, Cedarhurst, L. I., N. Y.
Terminal blocks; metal and plastic fabricated products

Excelsior Supply Co., 18 Letchworth St., Buffalo 13, N. Y.

Exline Engineering Co., 107 W. Second St., Tulsa 3, Oklahoma
Hydraulic, mechanical, and electromechanical instruments and controls for industry

F

F-R Machine Works, Inc., 26-12 Borough Pl., Woodside 77, N. Y.

Fafnir Bearing Co., 37 Booth St., New Britain, Conn.

Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Ill. Electronics Div., 2212 E. 12th St., Davenport, Iowa
Scales; pumps; electrical generating plants

Fairchild Camera & Instrument Corp.:
- Reconnaissance Systems Div., Robbins Lane, Syosset, L. I., N. Y.
- Industrial Camera Div., 88-06 Van Wyck Expressway, Jamaica 1, N. Y.
  Photographic equipment
- Electrical Products Div., 110 Main St., Burlington, Vt.

Fairchild Controls Corp., Components Div., 225 Park Ave., Hicksville, L. I., N. Y.
Potentiometers; pressure transducers

Fairchild Electrotechnics Div., Fairchild Engine & Airplane Corp., 118 E. 16th St., Costa Mesa, Calif.
Automatic data recording and control systems; voltage ratio indicators; resistance bridge indicators; plotters

Fairchild Graphic Equipment, Inc., 88-06 Van Wyck Expressway, Jamaica 1, N. Y.
Electronic cameras

Fairchild Industries Div., Burlington, Vt.
Fractional-hp motors

Fairchild Industries Div., Burlington, Vt.
Fractional-hp motors

Fairchild Recording Equipment Corp., 154 St. & 7th Ave., Whitestone, N. Y.
Magnetic tape recorders

Falstrom Co., 92 Falstrom Ct., Passaic, N. J.
Steel instrument panels; panel board assemblies; cubicles; totally enclosed weather and vermin-proof instrument enclosures and steel cabinets

Fansteel Metallurgical Corp., 2200 Sheridan Rd., North Chicago, Ill.
Rectifiers; special alloys

Farmer Electric Products Co., Inc., 2300 Washington St., Newton Lower Falls, Mass.
Automatic timers; relays; switches

Farnsworth Electronics Co., 3700 E. Pontiac St., Fort Wayne 1, Ind.
Guidance, control, and support instrumentation for missiles; airborne fire control and navigation radar; special purpose tube design and production; telemetering systems

Farnsworth Electronics Co., Pacific Div., 815 S. San Antonio Rd., Palo Alto, Calif.
Hermetically sealed individual terminals; multiple headers; plugs; pressure terminals; end seals; compression seals; custom seals; rotary instrument switches

Farrand Optical Co., Inc., 4401 Bronx Blvd., New York 70, N. Y.
Automatic machine tool controllers

Farrand Optical Co., Inc., 4401 Bronx Blvd., New York 70, N. Y.
Scientific instruments

Farris Engineering Corp., 436 Commercial Ave., Palisades Park, N. J.
Safety and relief valves; naval and aircraft regulators; hydraulic remote controls

Farris Flexible Valve Corp., 436 Commercial Ave., Palisades Park, N. J.
Manually and automatically operated valves

Farris Pickering Governor Co., 400 Commercial Ave., Palisades Park, N. J.
Speed regulators; pump controllers; control valves

Farris-Stacon Corp., 345 Commercial Ave., Palisades Park, N. J.
Automation controllers; valves

Fasco Industries, Inc., Motor Sales Div., P. O. Box 509, Rochester 2, N. Y.
Fractional-hp motors

Fassett Co., Inc., C. M., 21 W. Main Ave., Spokane 8, Wash.
Laboratory supplies

Fast & Co., John E., 3582 N. Elston Ave., Chicago 18, Ill.
Capacitors

Fawley-Brost Co., 111 N. Wacker Dr., Chicago 6, Ill.

Fecker, J. W., Inc., 6592 Hamilton Ave., Pittsburgh 6, Pa.
Astronomical instruments

Federal Bearings, Inc., Poughkeepsie, N. Y.

Federal Anti-Capacity Switch Corp., 1200 Niagara St., Buffalo, N. Y.
Anti-capacity switches

Federal Classifier Systems, Inc., 127 N. Dearborn St., Chicago 2, Ill.
Particle size classifiers

Federal Instrument Co., 14-02 Broadway, Long Island City 2, N. Y.
Resistors

Federal Machine & Welder Co., Clermont Ave., Warren, Ohio

Federal Mfg. & Engrg. Corp., 211 Steuben St., Brooklyn 5, N. Y.
Microscopes

Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
Precision measuring instruments
(See advertisement on page 37)

Federal Screw Products Inc., 3917 N. Kedzie Ave., Chicago 18, Ill.
Hardware for instrument manufacturing
(See advertisement on page 193)

Federal Shock Mount Corp., 1060 Washington Ave., New York 56, N. Y.
Vibration isolators; shockmounts; mounting bases

Federal Telephone and Radio Co., 100 Kingsland Road, Clifton, N. J.
Radio transmitting and direction finding equipment; transmitting tubes; field intensity meters

Federal Tool Engrg. Co., 1384 Pompton Ave., Cedar Grove, N. J.
Welding machines, and accessories

Federated Metals Div., American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.

Feedback Controls, Inc., 899 Main St., Waltham 54, Mass.
Electrical and electronic instruments; control systems; computers

Feiler Engineering & Manufacturing Co., 8026 N. Monticello Ave., Skokie, Ill.
Electrical instruments

Fellows Gear Shaper Co., 78 River Rd., Springfield, Vt.
Gear checking machines; involute measuring machines

Femco, Inc., Box 32, Irwin, Pa.
Plant intercom; audio amplifiers; remote and supervisory control equipment and systems

Fenwal Inc., Fenwal Sales Office Bldg., Leland St., Ashland, Mass.
Industrial thermostats

Fenway Machine Co., Edgemont & Clementine Sts., Philadelphia 34, Pa.
Drilling and drill grinding machines; power supplies
(See advertisements on pages 10, 138, 263)

Ferguson Co., 814 Ridgely St., Baltimore 30, Md.
Laboratory supply house

Ferner Co., R. Y., 110 Pleasant St., Malden, Mass.
Precision instruments
(See advertisement on page 51)

Ferrara, Inc., 8106 W. 9 Mile Rd., Oak Park 37, Mich.
Automatic controllers; relays

Ferrier Engineering, 24 Benton St., Springfield, Mass.
Special instruments; test stands for automatic and diesel industries

Ferranti Electric, Inc., 30 Rockefeller Plaza, New York 20, N. Y.
Electrical instruments; digital data processing and control systems

Ferris Instrument Co., Boonton, N. J.
Laboratory and production testing equipment: radio noise and field strength meters and special electrical instruments

Fidelity Machine Co., 3906 Frankfort Ave., Philadelphia, Pa.
Abrasion testers

Field Electrical Instrument Co., 8 North Manheim Blvd., New Paltz, N. Y.
Vacuum Thermocouples

Fielden Instrument Div., Robertshaw-Fulton Controls Co., 2900 N. 4th St., Philadelphia 33, Pa.
Automatic controllers, electrical instruments

Film Capacitors, Inc., 337 E. 139 St., New York 54, N. Y.
Fixed and variable capacitors

Filtors, Inc., 30 Sagamore Hill Dr., Port Washington, L. I., N. Y.
Subminiature relays

Fineisen, A. R., 114-102 230th St., Cambria Heights, L. I. 11, N. Y.
Precision drilling and nutting machines; crystal electrodes; conductive paints; drill heads; hobs for fine pitch gears
(See advertisement on page 138)

Finn & Co., Inc., T. R., 200 Central Ave., Hawthorne, N. J.
Shock and vibration control equipment

Fischer & Porter Co., 775 Warminster Rd., Hatboro, Pa.
Rotameters; sight flow meters; automatic flow controllers; precision optical cells; precision bore glass tubing; special precision glass apparatus; automatic data loggers and control systems; centralized control panels

Fish-Schurman Corp., 70 Portman Rd., New Rochelle, N. Y.
Scientific instruments; optical, technical and scientific glass and porcelain
(See advertisement on page 121)

Fisher Governor Co., Marshalltown, Iowa
Motor control valves & regulators

Fisher-Pierce Co., 170 Pearl St., South Braintree, Mass.
Photoelectric controls; relays; timers

Fisher Research Laboratory 1961-63-65 University Ave. Palo Alto, Calif.
Electromagnetic metal pipe and cable locators; sound leak detectors; pipe and sound detecting instruments; Geiger and scintillation counters

Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa.
Standard and special equipment and instruments for chemical, biological and metallurgical laboratories

Fitzpatrick Electric Supply Co., 444 Irwin St., Muskegon, Mich.
Ductile bismuth wire
(See advertisement on page 244)

Fleischhauer & Son, F., 89-36 187 Place, Hollis, L. I., N. Y.
Instrument makers

Flett Laboratory, 3711 Marshall Rd., Drexel Hill, Pa.
Fade-o-meters; G-M counters; traffic signal equipment

Flexonics Corp., 1315 S. Third Ave., Maywood, Ill.
Hydraulic and pneumatic bellows and tubing

Flight Research Inc., P. O. Box 1-F, Richmond 1, Va.
Data recording cameras and accessories; aircraft instruments and accessories; semi-conductor grade single crystal silicon

Flow Corp., 283 Concord Ave., Cambridge 38, Mass.
Flow rate and pressure instrumentation and components
(See advertisement on page 110)

Fluke Mfg. Co., Inc., John, 1111 W. Nickerson St., Seattle 99, Wash.
Electrical and electronic instruments; power supplies

Fluor Corp., Ltd., Box 7030 East L. A. Branch, Los Angeles 22, Calif.
Pressure snubbers and pulsation dampers

Fonda Gage Corp., 200 Henry St., Stamford, Conn.
Gage blocks

Food Technology, Inc., 5903 NW Highway, Chicago 31, Ill.
Temperature and humidity chambers; testing apparatus

Forte & Co., Wm. A., 216 Nicholas Ave., Brooklyn 8, N. Y.

Ford Engineering Co., 129 E. "A" St., Upland, Calif.
Precision variable resistors

Ford Instrument Co., Div. of Sperry-Rand Corp., 31-10 Thomson Ave., Long Island City 1, N. Y.
Airborne and ground instruments; automatic controllers; servomechanisms

Formica Co., Cincinnati 32, Ohio
Laminated plastic (formica) rods, sheets and tubes

Forro Scientific Co., 833 Lincoln St., Evanston, Ill.
Laboratory, industrial-process, dimensional, and nuclear instrumentation; components

Fosdick Glass Co., 4301 N. Main St., Dayton 5, Ohio
Reflectors; lenses; optical flats; optical components

Foster Engineering Co., 835 Lehigh Ave., Union, N. J.
Control valves; flow tubes

Fox Valley Instrument Co., Route 1, Highway 27, Cheboygan, Mich.
Industrial and automatic service instruments

Foxboro Co., 468 Neponset Avenue, Foxboro, Mass.
Instruments for the measurement and control of industrial process variables
(See advertisement on pages 16-17)

Frangible Discs, Inc., 57 Railroad Ave., Penns Grove, N. J.
Safety discs; fuse plugs

Franklin Electronics Inc., East 4th St., Bridgeport, Penna.
Instrumentation and data reduction equipment; mobile broadcast receivers f.m.

Franklin Mfg. Co., A. W., 175 Varick St., New York 14, N. Y.

Fraser Development Laboratory, P. O. Box 73, Huntington Station, N. Y.
Fluxometer for measuring magnetic flux in gauss

Freas Glass Works, F. L., 140-150 E. 9th Ave., Conshohoken, Pa.
Hydrometers; thermometers; glass instruments

Frederick and Associates, Carl L., 4630 Montgomery Ave., Bethesda 14, Md.
Technical reference service

Fredericks Co., George E., Ann St., & Philamont Rd., Bethayres, Pa.
Glass Instruments and apparatus

Freed Inc., J. Melvin, Perkasie, Pa.
Flat glass products

Freed Transformer Company, Inc., 1718 Weirfield St., Brooklyn 27, N. Y.
Transformers; reactors; filters, magnetic amplifiers, toroid inductors; laboratory test equipment; electronic counters
(See advertisement on pages 92, 189)

Freeco Incorporated, 406 N. Craig St., Pittsburgh 13, Pa.
Receiving antennas and accessories; photo diodes; semi-conductor photo diodes; scintillation crystals; open lead-in wire; optical crystals

Frick Co., Waynesboro, Pa.
Float valve controls; electric controls; refrigerating and air conditioning machinery

Friden Calculating Machine Co., 2350 Washington Ave., San Leandro, Calif.
Automatic calculators; adding machines; automatic billing machines; integrated data processing equipment; automatic writing and composing machines

Friedrich & Dimmock, Inc., Lincoln Ave., Millville, N. J.
Laboratory apparatus

Friez Instrument Div., Bendix Aviation Corp., Towson 4, Md.
Temperature and humidity controls; gas and stoker controls; damper motors; electrical relays; temperature and humidity indicators and recorders; psychrometers; draft gages; anemometers; CO_2 analyzers

Fruengel Inc., Frank, 2728 Ferncliff Ave., Dayton 10, Ohio
Electrical and electronic test instruments; stroboscopes

Fuel Watchman, 77-29 138 St., Flushing, L. I., N. Y.

Fuess, Inc., 39 W. 60th St., New York 23, N. Y.
Scientific instruments

Fulcrum Oil Company, Franklin, Pa.
Instrument oils

Fuller Co., 124 Bridge St., Catasauqua, Pa.
Bulk material level controllers

Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville 4, Tenn.
Temperature and pressure regulators; sylphon bellows; thermostat assemblies; diesel controls; automobile thermostats; air conditioning controls

Furnas Electric Co., 300 McKee St., Batavia, Ill.
Electric motor controls

Furst Electronics, 1938 E. Fairchild Ave., Danville, Ill.
Electronic instruments

Fusion Engineering, 17291 Roseland Ave., Cleveland 12, Ohio
Solders and soldering equipment

Fusite Corporation, 6000 Fernview Ave., Cincinnati 13, Ohio

G

G. & G. Precision Works, Inc., 5-33 Forty-eighth Ave., Long Island City 1, N. Y.
Mechanical optical and electrical precision instruments

G-M Laboratories, Inc., 4300 N. Knox, Chicago 41, Ill.
Galvanometers and galvanometer relays

G. R. S. Corp., 6533 N. Olmstead Ave., Chicago 31, Ill.

G-V Controls Inc., 28 Hollywood Plaza, East Orange, N. J.
Relays; switches

Gadgets, Inc., 3629 N. Dixie Drive, Dayton 4, Ohio
Airborne and ground instruments; testing chambers

Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14, Ill.
Precision, scientific, optical, and measuring instruments for use in industrial, research, educational and gage laboratories; inspection and tool and die departments
(See advertisement on page 98)

Gallien, & Son, R. P., 220 W. 5th St., Los Angeles 13, Calif.
Instrument lathes and tools
(See advertisement on page 137)

Gamewell Co., 1238 Chestnut St., Newton Upper Falls 64, Mass.
Precision potentiometers

Gar Electrical Instrument Corp., 92-15 172nd St., Jamaica, L. I., N. Y.

Gar Precision Parts, Inc., 40 Ludlow St., Stamford, Conn.

Garde Manufacturing Co., 588 Eddy St., Providence 3, R. I.
Insulated terminals; terminal boards; allied components

Gardner Laboratory, Inc., 5521 Landy Lane, Bethesda 14, Md.,

the ONLY **PORTABLE NIBBLER**
that **CUTS** 10 Gauge Steel
Without Distortion!

A big statement . . . and only Fenway can make it! Our portable Nibblers have solved unusual problems for hundreds of users. Complete line includes the 14 gauge Nibbler and a light-duty 18 gauge Nibbler, and a special 90° head for each.

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Model HN for 10 gauge Stainless Steel and 8 gauge Mild Steel. 6" radius.

Model MN for 14 gauge Stainless Steel and 13 gauge Mild Steel. 1" radius.

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Gardner Pad Co., Inc., River St., Wolfeboro, N. H.

Garlock Packing Co., Palmyra, N. Y.
Mechanical packings; gaskets; plastic products

Garlynn Engineering Co., 755 Pennsylvania Ave., San Francisco 7, Calif.
Hydrological and surveying instruments

Gas Appliance Specialties Co., 32-37 56th St., Woodside, New York, N. Y.
Gas regulators

Gast Mfg. Corp., Box 117, Benton Harbor, Mich.
Vacuum pumps

Gates & Co., Inc., Geo W., Hempstead Pike & Lucille Ave., Franklin Square, L. I., N. Y.
Visible and ultraviolet light sources

Gates Electronic Co., 2090 Barnes Ave., New York 62, N. Y.
Laboratory supply house

Gatti, Inc., Aurele M., 524 Tindall Ave., Trenton 9, N. J.
Mounted or unmounted sapphire and ruby bearings for instruments; special shape sapphire wearparts

Gaydon Co., 561-3946 Ellington, Western Springs, Ill.
Automatic controllers; alarm systems

Gear Supply Co., 880 El Camino Real, Belmont, Calif.
Gears; splines; machined components; gear assemblies

Geier & Bluhm, Inc., 670 River St., Troy, N. Y.
Spirit levels, circular and tubular, mounted and unmounted; cohesion testers; small mechanical devices
(See advertisement on page 134)

Gelber Co., Samuel S., 162 N. Clinton St., Chicago 6, Ill.
Balancing machines; pumps

Gem Instrument Mfg. Co., 6523 Euclid Ave., Cleveland 3, Ohio
Dial indicators

Gems Company, Newington, Conn.

Genales, Andres, 29 Second Ave., Nyack, N. Y.
Toolroom test indicators

General Alloys Co., 405 First St., South Boston, Mass.

General Aniline & Film Corp., 270 Park Ave., New York 17, N. Y.

General Biological Supply House, Inc., 8200 S. Hoyne, Chicago 20, Ill.
Biological laboratory supplies

General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
Switches; cement tester; spark plug tester

General Ceramics Corp., Keasbey, N. J.

General Chemical Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

General Control Co., 1205 Soldiers Field Rd., Boston 34, Mass.
Electrical switches; control units; timers

General Controls Co., 801 Allen Ave., Glendale 1, Calif.
Pressure, temperature and flow control valves

General Crystal Co., Burlington, Iowa

General Cybernetics Associates, 1751 N. Coronado St., Los Angeles 26, Calif.
Computers; automatic controllers; gages

General Devices, Inc., P. O. Box 253, Princeton, N. J.
Remote-control systems; flight-test equipment; switches
(See advertisement on page 204)

General Electric Co. (GE), 1 River Rd., Schenectady 5, N. Y.
Electrical instruments and meters
(See advertisement on Front Cover)

General Electric Co. (GE), 1285 Boston Ave., Bridgeport 2, Conn.
Rectifiers and switches

General Electric Co. (GE), Apparatus Sales Div., 1 River Rd., Schenectady 5, N. Y.

General Electric Co. (GE), Chemical & Metallurgical Div., 1 Plastics Ave., Pittsfield, Mass.
Magnets and instrument oils

General Electric Co. (GE), Electronics Div., Electronics Park, Syracuse, N. Y.
Oscillographs; tube analyzers; frequency instruments and crystals; nuclear measuring instruments; power supplies; closed circuit television

General Electric Co. (GE), Instrument Dept., 40 Federal St., West Lynn, Mass.
Electrical and electronics instruments; industrial-process instruments and components; aviation instruments; laboratory instruments

General Electric Co. (GE), Lamp Dept., Nela Park, Cleveland 12, Ohio
Incandescent and glow lamps

General Electric Co. (GE), Lamp Wire and phosphors Dept., 1331 Chardon Rd., Cleveland 17, Ohio
Tungsten, molybdenum and cathode ray tube phosphors; tungsten and molybdenum products available as powder, rod, wire, sheets, and fabricated parts

General Electric Co. (GE), Metallurgical Products Dept., 11177 E. 8 Mile Rd., Detroit 32, Mich.
Carboloy cemented carbides; Alnico permanent magnets

General Electric Co. (GE), Small Integral Motors Dept., 1605 Winter St., Fort Wayne 4, Ind.
Integral-hp single and polyphase induction and hermetic motors

General Electric Co. (GE), Telechron Dept., Ashland, Mass.
Electric clocks; standard clocks; automatic timers; synchronous motors

General Electric Co. (GE), Textolite Dept., Coshocton, Ohio

General Electric Co. (GE), Tube Dept., Bldg. 3, C.A.R.T., 3001 Cambell Rd., Schenectady 5, N. Y.
Electron tubes for receiving, transmitting and power service; cathode-ray tubes

General Electric (GE), X-Ray Dept., 4855 Electric Ave., Milwaukee 1, Wis.
Medical, dental and industrial X-ray apparatus, accessories and supplies

General Industries Co., Elyria, Ohio

General Etching & Mfg. Co., 3070-3082 W. Grand Ave., Chicago 22, Ill.

General Industries Co., Elyria, Ohio
Fractional-hp motors

General Instrument Co., Box 7154, Indianapolis 18, Ind.
Automatic control systems; electrical and mechanical instruments

General Instrument Corp., F. W. Sickles Div., P. O. Box 330, Chicopee, Mass.

General Laboratory Supply Co., P. O. Box 2607 Paterson, N. J.
Laboratory apparatus and supplies

General Magnetic Corp., 1001 Erwin Ave., Detroit 34, Mich.

General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N. J.
Automatic controllers and regulators

General Motors Corp., Delco Appliance Div., 391 Lyell Ave., Rochester 1, N. Y.

General Mills, Inc., Mech. Div., 1620 Central Ave., Minneapolis 13, Minn.
Industrial, aircraft, testing and military instruments; telemetering and control systems

General Photo Products Co., Inc., General Photo Bldg., Chatham, N. J.
Dry and wet photocopy equipment and supplies

General Physical Laboratory, 509 Fifth Ave., New York 17, N. Y.
Special light sources

General Plate Div., Metals & Controls Corp., Attleboro, Mass.
Solid and clad, precious and base metals; thermostat metals; electrical contacts; industrial metals

General Precision Lab., Inc., 63 Bedford Rd., Pleasantville, N. Y.
Airborne navigation systems; broadcast, industrial, institutional and military television equipment
(See advertisement on page 212)

General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass.
Radio and electrical measuring instruments for laboratory and industrial use; stroboscopes; noise measuring equipment; measuring and test equipment for electrical communication systems

General Regulator Corp., 165 Broadway, New York 6, N. Y.
Combustion, draft, liquid level and pressure controls

General Scientific Corp., 5151 West 65th St., Chicago 38, Ill.
Lenses; mirrors; optical parts & systems; photoelectric cells

General Scientific Div., Columbia Machine & Die Co., 12017 Vose St., North Hollywood, Calif.

General Scientific Equipt. Co., 2700 W. Huntington St., Philadelphia 32, Pa.
Automatic water stills; laboratory instruments and accessories

General Test Equipment Co., 101 Windsor Pl., Syracuse 10, N. Y.
Pen size radio signal source; special apparatus

General Tire & Rubber Co., Wabash, Ind.
Shock mountings

General Transformer Co., 18240 Harwood Ave., Homewood, Ill.

General Transistor Corp., 130-11 90th Ave., Richmond Hill 18, N. Y.
Transistors; rectifiers; diodes; transistor test sets

General Tungsten Mfg. Co., Inc., 502-23rd St., Union City, N. J.

General Ultrasonics Co., 67 Mulberry, Hartford 3, Conn.
Ultrasonic equipment; instrument cleaning equipment

Genisco Inc., 2233 Federal Ave., Los Angeles 64, Calif.
Testers for aviation instruments; guided missile instrumentation; components; digital-output converters and comparators; accelerometer

Genzlinger, Inc., R. G., Neshaminy, Pa.
Amplifiers; control systems; ultrasonic equipment

Geophysical Instrument Co., Div. Georator Corp., Manassa, Va.
Electrical and electronic balances; radioactivity instrumentation

Georator Corporation, Manassas, Virginia
Geophysical instruments; ac and dc generators

George-Held, Inc., 1020 N. LaBrea, Los Angeles 38, Calif.
Environment resistant, low drift, sealed trimmer potentiometers for panel and printed circuit mounting

Geotechnical Corp., 3712 Haggar Drive, Dallas 9, Texas
Manufacturers of instruments and components for geophysical, industrial and research applications
(See advertisement on page 194)

Gerber Scientific Instrument Co., 162 State St., Hartford 1, Conn.
Analog computers; computing scales

Gerlin Corp., P. O. Drawer 307, Avon, N. J.

Germanium Products Corp., 26 Cornelison Ave., Jersey City 4, N. J.
Rectifiers; transistors

Germanow-Simon Machine Co., Inc., 408 St. Paul St., Rochester 3, N. Y.
Plastic sheets; thermometers; barometers; timers; face crystals for gages and instruments; surface grinding machines

Gertsch Products, Inc., 11846 Mississippi Ave., Los Angeles 25, Calif.
Frequency standards; frequency meters; filters; voltage dividers; vacuum tube voltmeters
(See advertisement on page 224)

Giannini & Co., G. M., 918 E. Green St., Pasadena 15, Calif.
Airborne transducers; gyro instruments; air data computers; digital data recording systems; industrial automation equipment; precision potentiometers; stepping motors; switching commutators
(See advertisement on page 62)

Giannini Datex Div., 1307 S. Myrtle Ave., Monrovia, Calif.
Digital data handling recording systems and equipment

Gibson Electric Co., 8350 Frankstown Ave., Pittsburgh 21, Pa.
Electrical contacts; contact assemblies

Giffels & Vallet, Inc., 1000 Marquette Bldg., Detroit 26, Mich.

Gilbert & Barker Mfg. Co., West Springfield, Mass.
Tank gages; automatic samplers; pumps

Gilman Engineering & Mfg. Corp., 300 W. Eastern Ave., Janesville, Wis.

Gilman Scientific Instrument Co., 527 S. Fair Oaks Ave., Pasadena 1, Calif.
Seismological instruments

Gilmore, E. R., Box 5718, Homewood St., Pittsburgh 8, Pa.
Gas leak stethoscopes

Gilmore Industries, Inc., 5713 Euclid Ave., Cleveland 3, Ohio
Automatic-control systems; measuring instruments; telemetering systems; scales; continuous-weighing systems; dynamometers

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Static & dynamic balancing machines; surface finishing machines

Gits Bros. Mfg. Co., 1846 S. Kilbourn Ave., Chicago 23, Ill.
Lubricating devices; mechanical shaft seals

Glaser Enterprises, Inc., 4746 W. Washington Blvd., Los Angeles 16, Calif.
Lightweight pressure gauges, direct drive

Glass Engineering Laboratories, Inc., 601 O'Neill Ave., Belmont, Calif.

Laboratory apparatus; ultra-speed centrifuges; heat exchangers

Glass Instruments, Inc., 2285 E. Foothill Blvd., Pasadena, Calif.
Technical glassblowing; scientific glass instruments; glass-to-metal sealing; laboratory apparatus
(See advertisement on page 120)

Glass Products Co., 6911 S. Chicago Ave., Chicago, Ill.

Gleason-Avery Inc., 45 Aurelius St., Auburn, N. Y.
Fractional-hp motors

Glenco Corp., 212 Durham St., Metuchen, N. J.

Glo-[illegible]ite Products, Inc., 6417 N. California Ave., Chicago 45, Ill.

Globe Industries, Inc., 1784 Stanley Ave., Dayton 4, Ohio
Aircraft instrument testing equipment; aircraft interval timing instruments; aircraft photo equipment; automatic control instruments

Globe Phone Mfg. Corp., 2 Linden St., Reading, Mass.
Pipe locating equipment; leaky valve locators; hearing aids; secret phone or listening equipment for government investigating agencies

Globe Tool & Engrg. Co., 5051 Kitridge Rd., Dayton 4, Ohio
Dynamic balancing equipment

Glo[illegible] & Co., Inc., 1912 W. Birchwood, Chicago 26, Ill.
Cal[illegible]s

Glowmeter Corp., 37 Franklin St., Buffalo 2, N. Y.
Condensed indicating warning system with quantitative displays; qualitative warning signal system; alarm-signal photorecorder

Goe Engineering Co., 219 S. Mednik Ave., Los Angeles 22, Calif.
Terminal lugs; panel handles; insulated feed-thrus; shaft locks

Goerz American Optical Co., C. P., 317 East 34th St., New York 16, N. Y.
Photographic lenses, optical prisms and flats, and other optical units to specification

Gogan Machine Corp., 1440-54 E. 55 St., Cleveland 3, Ohio
Automatic hardness testers

Gold Seal Mfg. Co., 1223 W. Kenzie St., Chicago 22, Ill.

Goldak Co., Inc., 1544 W. Glenoaks Blvd., Glendale 1, Calif.
Surveying instruments; pipe locators; leak detectors

Golden-Anderson Valve Specialty Co., 1286 Ridge Ave., Pittsburgh 33, Pa.
Altitude control valves; pressure regulating valves; hydraulic operated valves

Good, Inc., James, Susquehanna Ave. & Martha St., Philadelphia 25, Pa.

Goodrich Co., B. F., 450 South Main St., Akron, Ohio
Belting; hose; packing; industrial rubber products

Goodyear Aircraft Corp., 1210 Massillon Rd., Akron 15, Ohio
Electronic computers; flight test and fire control instruments

Goodyear Tire & Rubber Co., Inc., Akron 16, Ohio
Aircraft ice-warning equipment

Gordon Co., Claud S., 3000 S. Wallace St., Chicago 16, Ill.
Pyrometers; metallurgical testing machines; thermocouples; thermocouple wire; lead wire; insulators

Gordon Enterprises, 5362 N. Cahuenga Blvd., No. Hollywood, Calif.
Optical instrument testers; photogrammetric instruments; special cameras; optical instruments and components

Gordon Machine & Tool Co., Inc., Ruan & Tackawanna St., Phila. 24, Pa.
Thermocouples; thermocouple wells

Gordos Corporation, 250 Glenwood Ave., Bloomfield, N. J.
Diode rectifier and battery charger tubes; mercury switches; r-f transformers

Ge[illegible]ac Products, Inc., 933 Twelfth St., Racine, Wis.

Go[illegible]an Manufacturing Corp., 2240 Sepulveda Blvd., Los Angeles 64, Calif.

Gorton Machine Co., George, Racine, Wis.
Pantographs; die and mold duplicators; milling machines; screw machines; cutter grinders

Gorrell & Gorrell, Haworth, N. J.
Equipment for biological and psychological work

Goslin Electric & Manufacturing Co., Div. of Goslin Co., 2921 Olive St., Burbank, Calif.
Transformers; filter reactors; charging reactors; voltage regulators; electronic sub-assemblies; transmitting and receiving equipment

Gotham Audio Development Corp., 2 W. 46th St., New York 36, N. Y.
Amplifiers; audio equipment

Gotham Instruments Div., American Machine & Metals, Inc., 233 Broadway, New York 7, N. Y.
Indicating dial and recording thermometers

Gotham Scientific Co., 106 Water St., New York 5, N. Y.
Laboratory supplies

Gould Co., J. D., 730 E. Washington St., Indianapolis 2, Ind.
Electrically-operated valves
(See advertisement on page 236)

Gove's Sons, Hartley, 10 Howard St., Vineland, N. J.

Gow-Mac Instrument Co., 100 Kings Road, Madison, N. J.
Gas chromatography, gas purity and gas mixing instruments, thermal conductivity type, including—sensing elements for operation to 200°C
(See advertisement on page 78)

Graf-Apsco Co., 5868 Broadway, Chicago 40, Ill.
Optical instruments and components; surveying and drafting instruments

Graflex Inc., 154 Claressa St., Rochester 8, N. Y.
Scientific cameras

Grain Laboratory Equipment Inc., Long Lake, Minn.
Moisture meters; agricultural instruments; germination cabinets

Gramer-Halldorson Corp., 2734 N. Pulaski Rd., Chicago 39, Ill.
Transformers: instrument, power, adjustable, phasing, regulating

Grammes Co., L. F., 384 Union St., Allentown, Pa.

Grant Gear Works, 154 W. 2nd St., Boston, Mass.
Precision gears

Grant Pulley & Hardware Corp., 31-85 Whitestone Parkway, Flushing 54, N. Y.
Drawer and industrial slides

Graphik Circuits, Div. of Cinch Mfg. Co., 200 S. Turnbull Canyon Rd., Puente, Calif.
Production; design; drafting; artwork; development; prototyping; fabricating; mechanical assembly; electrical assembly; encapsulating of printed circuits

Graphite Metallizing Corp., 1050 Nepperhan Ave., Yonkers, N. Y.
Bearings; bushings; brushes; contacts

Grass Instrument Co., 101 Old Colony Ave., Quincy, Mass.
Kymograph and oscilloscope cameras

Graton & Knight Co., 356 Franklin St., Worcester, Mass.
Leather cases and products for instruments, cameras, etc.
(See advertisement on page 75)

Gray Instrument Co., 200 E. Church Lane, Philadelphia 44, Pa.
Scientific instruments
(See advertisement on pages 73, 164)

Graydon Smith Products Corp., 52 Commonwealth Ave., West Concord, Mass.

Grayhill, 561 Hillgrove Ave., LaGrange, Ill.
Switches; insulators; test clips

Green Instrument Co., 385 Putnam Ave., Cambridge 39, Mass.
Pantograph engraving machinery; cutter grinders; rotary tables and related equipment
(See advertisement on page 136)

Green Instruments, Inc., Henry J., 1191 Bedford Ave., Brooklyn 16, N. Y.
Fortin type mercurial barometers; indicating and/or recording instruments for temperature, humidity, precipitation, wind velocity and wind direction
(See advertisement on pages 68, 125)

Green Rectifier Co., 83 Murray St., New York 7, N. Y.
Power supplies; rectifiers; vacuum gages; controllers; indicators; thermistor instruments

Greenfield Tap & Die Corp., Greenfield, Mass.
Machine shop gages

Greenleaf Mfg. Div., Mandrel Industries, Inc., 7814 Maplewood Industrial Ct., St. Louis 17, Mo.
Gyroscopes; gyro servo test tables; self-balancing strain gage systems; accelerometers; servo motors; airspeed indicators

Greenlee Co., Geo. H., 1514 W. Adams St., Chicago 7, Ill.

Greibach Instruments Corp., 212 Durham Ave., Metuchen, N. J.

Greiner Glassblowing Lab., 3604 E. Medford St., Los Angeles 63, Calif.
Manufacturers and distributors of glass aparatus and instruments for scientific research, industry and education
(See advertisement on page 121)

Greiner Co., Emil, 20-26 N. Moore St., New York 13, N. Y.
Laboratory supplies

Griebel Co., E., 8 Wayne St., Carbendale, Pa.
Thermometers; hydrometers; chemical and laboratory glassware

Gries Reproducer Corp., 50 Second St., New Rochelle, N. Y.

Grieve-Hendry Co., Inc., 1401-17 W. Carroll Ave., Chicago 7, Ill.
Laboratory ovens

Grigoleit Co., 746 E. North St., Decatur, Ill.

Griner Co., A. J., 1827 McGree St., Kansas City 8, Mo.
Laboratory supplies

Grinnell Co., Inc., 260 W. Exchange St., Providence 1, Rhode Island
Control Valves

Griswold Mfg. Co., F. T., 315 W. Lancaster Ave., Wayne, Pa.
Optical instruments

Grobet File Co. of America, Carlstadt, N. J.

Grove Valve & Regulator Co., 6529 Hollis St., Oakland 8, Calif.
Pump governors; pressure reducing and back pressure regulators for gas or liquid
(See advertisement on page 173)

Gruen Watch Co., Norwood Div., Beech & Kenilworth Sts., Cincinnati 12, Ohio

Guardian® Electric Mfg. Co., 1621 W. Walnut St., Chicago 12, Ill.
Ac and dc relays
(See advertisement on page 184)

Gubelman Publishing Co., 100 E. Kinney St., Newark 5, N. J.
Recording charts and papers
(See advertisement on page 76)

Gudeman Co. of Calif., Inc., 2669 S. Myrtle, Monrovia, Calif.

Gulton Mfg. Corp., 212 Durham St., Metuchen, N. J.
Accelerometers; ballistocardiographs; precision capacitors

Gurley, W. & L. E., 514 Fulton St., Troy, N. Y.
Surveying instruments; meteorological instruments; paper testing instruments; angular measuring devices; special optical instruments, binary code discs; precision patterns on glass
(See advertisement on page 154)

Gustafson Mfg. Co., G. D., 29 E. Madison St., Chicago 2, Ill.
Instrument tools
(See advertisement on page 163)

Gustaveson, Inc., 8600 Chestnut St., Kansas City, Mo.
Switchboards; instrument panels; special control devices

Guthery Machine Tool Corp., 38-31 Crescent St., Long Island City 1, N. Y.
Traub single spindle automatic screw machines
(See advertisement on page 137)

Gyromechanisms, Inc., New York Ave. at Halesight, Huntington L. I., N. Y.
Gyros; voltage dividing resistors

Gyroscopics, Inc., 65 Rushmore St., Westbury, L. I., N. Y.
Floated gimbal single degree of freedom rate and integrating gyroscopes; accelerometers; integrators; servo amplifiers; pickoffs; torque generators; gyro motors; magnetic clutches

H

H-B Instrument Co., Inc., American & Bristol Sts., Philadelphia 40, Pa.
Thermometers; hydrometers; remote control equipment; mercury plunger relays

HD Electric Co., 760 Osterman Ave., Deerfield, Ill.
Split core ammeters; demand meters

H & H Thermostats, Inc., 682 Broadway, New York 12, N. Y.
Altimeters; recording thermometers; recorder ink for extreme temperatures

H & H Machine Co., Noble & Jackson St., Norristown, Pa.
Electronic Parts
(See advertisement on page 230)

H.J.J. Co., 17510 Farley Rd., Los Gatos, Calif.
Instrument tools

H. & O. Co., 648 Saylor Ave., Elmhurst, Ill.

Hacker & Co., Inc., Wm. J., 82 Beaver St., New York 5, N. Y.
Microscopes; spectroscopes; melting-point apparatus; testing machines; optical components

Hadley Assoc., Inc., H. R., 41 Barlow St., Winooski, Vt.
Weighing equipment; automatic fillers; vacuum pumps

Hagan Corp., Hagan Bldg., Pittsburgh 30, Pa.
Combustion control equipment; flow meters; draft and pressure gages for low pressure gas and air measurements: recording, indicating and integrating
(See advertisement on page 49)

Hagen Mfg. Co., 202 20th St., Moline, Ill.
Synchronous motors; interval timers; impulse counters

Hager & Sons, E. F., 98-02 217th Lane, Queens Village 9, Long Island, N. Y.

Haines Designed Products Corp., 1840 Howell Ave., Dayton 7, Ohio
Photometers

Hairspring Vibrating Co., 406 32nd St., Union City, N. J.

Halax Corp., 17470 Shelbourne Way, Los Gatos, Calif.
Special bearings; aluminum components; component assemblies for aircraft electronics and avionics

Haledy Electronics Co., 57 William St., New York 5, N. Y.
Automatic timers; photoelectric control systems; synchroscopes; relays and switches

Hall-Barkan Instruments, Inc., 181 Marbledale Road, Tuckahoe 7, N. Y.
Instrument components

Hall Co., Gordon L., Old Lyme, Conn.
Assembly bins and racks

Hall Sonic Engineering Co., Inc., 2402 2nd St., Peru, Ill.

Halliburton Oil Well Cement Co., Duncan, Okla.
Oil well surveying instruments

Hallikainen Instruments, 1341 Seventh St., Berkeley, Calif.
Automatic-control systems; gas and liquid analyzers; oil-testing instruments; pH equipment; photoelectric instruments; components

Haloid Co., 2-20 Haloid St., Rochester 3, N. Y.
Photocopy equipment

Hamilton Mfg. Co., Two River, Wis.
Laboratory furniture

Hamilton Rubber Mfg. Corp., Mead St., Trenton 3, N. J.

Hamilton Tool Co., 9th & Hanover, Hamilton, Ohio

Hammarlund Mfg. Co., Inc., 460 W. 34th St., New York 1, N. Y.
Electrical and electronic remote-metering and remote-control systems; components

Hammel-Dahl Co., 175 Post Road, (Warwick), Providence 5, R. I.
Diaphragm control valves of all types for standard or special applications; positioners; pressure pilots; temperature pilots; other allied control equipment
(See advertisement cn Inside Back Cover)

Hand & Sons Co., John E., Atlantic & Washington Aves., Haddonfield, N. J.
Navigational instruments

Handley Electronics, Inc., 14758 Keswick St., Van Nuys, Calif.
Absolute or differential pressure transducers with potentiometer or electro-magnetic output; visual temperature indicating instruments

Handy & Hardman, 82 Fulton St., New York 38, N. Y.
Linear wire-wound, voltage divider, custom built and special printed circuit type potentiometers

Hankison Corporation, 951 Banksville Rd., Pittsburgh 16, Pa.
Condensing type compressed air filters; small-volume desiccant dehydrators for low flow or dead end air service to 6000 psig
(See advertisement on page 58)

Hanna Engineering Works, 1765 No. Elston Ave., Chicago 22, Ill.
Air hydraulic cylinders; control valves

Hannifin Corp., 1101 S. Kilbourn Ave., Chicago 24, Ill.

Hanovia Chemical & Mfg. Co., Electrical Division, 100 Chestnut St., Newark 5, N. J.
Quartz mercury arc lamps

Hansen Electronics Co., 7117 Santa Monica Blvd., Los Angeles 46, Calif.
Graphic circuits; tape resistors; components

Hansen Manufacturing Co., 4031 W. 150th St., Cleveland 11, Ohio
Quick disconnect couplings

Hansen Mfg. Co., Inc., Princeton, Ind.
Electric Motors, servomechanism components, clock movements

Hansen Co., Wm., 165 Silverbrook Ave., Niles, Mich.
Timers and clocks

Hanson-Gorill-Brian, Inc., 85 Hazel St., Glen Cove, N. Y.
Aircraft and aviation instruments
(See advertisement on pages 95, 227)

Harco Laboratories, Inc., 77 Olive St., New Haven, Conn.
Pressure and temperature primary sensing elements

Hardwick, Hindle, Inc., 40 Hermon St., Newark 5, N. J.
Resistors

Harris & Co., Arthur, 212 N. Aberdeen St., Chicago 7, Ill.

Harris Manufacturing Co., 134 West 26th St., New York 1, N. Y.

Harrison Radio Corp., 225 Greenwich St., New York 7, N. Y.
Electrical and electronic instruments distributors

Hart Mfg. Co., 219 Bartholomew Ave., Hartford, Conn.
Electrical and electronic controls such as switches, relays, thermostats and wiring devices
(See advertisement on page 184)

Hart Mfg. Co., R. E., 5115 Carpenter Rd., Box 72, Ann Arbor, Mich.
Production counters

Harshaw Scientific Div., Harshaw Chemical Co., 1945 E. 97 St., Cleveland 6, Ohio
Laboratory supply house

Hart Moisture Gauges, see Kaydel Moisture Gauges

Hart Moisture Meters, Raymond S. Hart, Inc., 336 W. Islip Blvd., Babylon, L. I., N. Y.
Moisture testers

Hartford Machine Screw Co., 600 Capitol Ave., Hartford 5, Conn.

Hartford Steel Ball Co., Inc., Hartford 6, Conn.

Harvey Radio Laboratories, Inc., 447 Concord Ave., Cambridge, Mass.
Electronic apparatus

Harvey-Wells Electronics, Southbridge, Mass.
Aircraft navigational instruments

Harwood Co., Div., Avia Products Co., 7266 Beverly Blvd., Los Angeles, Calif.

Hasco Valve & Machine Co., 1263 N. 70th St., Milwaukee 13, Wis.
Automatic and manual control valves

Hasler-Tel Co., 30 Vesey St., New York 7, N. Y.
Speed indicators; portable; chronometric

Hass Brothers Instrument Co., 5476 Forestville Road, Washington 28, D. C.
Barometers; altimeters; manometers
(See advertisement on pages 69, 143)

Hassall, Inc., John, P. O. Box 2201, Westbury, L. I., N. Y.

Hastings-Raydist, Inc., P. O. Box 1275, Wythe Branch, Hampton, Va.
Electronic navigation, tracking, positioning and surveying equipment; vacuum, velocity and flow measuring instruments

Hathaway Instrument Co., 1315 S. Clarkson St., Denver 10, Colo.
Instruments and apparatus for electrical and mechanical measurements and control

Hausser & Son, C. A., 6040 Belfield Ave., Philadelphia 44, Pa.
Laboratory apparatus; biological instrumentation

Hawk Tool & Engineering Co., Inc., Clarkston, Mich.
Controllers and testing devices

Haydon Co., A. W., 232 N. Elm St., Waterbury 32, Conn.
Relays and timers
(See advertisement on page 27)

Haydon Manufacturing Co., 536 S. Leonard St., Waterbury 20, Conn.
Synchronous motors; automatic timers

Haydon Switch Co., 232 North Elm St., Waterbury 32, Conn.
Switches

Haydu Electronic Products Inc., 1426 W. Front St., Plainfield, N. J.

Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Special metal alloys, bushings, castings, tubing, wire

Hays Corp., P. O. Box 299, Michigan City, Ind.
Instrument and control systems for combustion, temperature, pressure, level, flow and gas analysis; data reduction systems

Hays Mfg. Co., Indus. Sales Div., 12th & Liberty Sts., Erie 6, Pa.
Flow Controls

Hayward Scientific Glass Corp., 217 Magnolia St., Whittier, Calif.
Optical glass manufacturing; special heat-treatment; blanks for small and massive optics; leadshielding types; prototype and pyrex glass; index measurement; research
(See advertisement on page 122)

Heat Timer Corp., 657 Broadway, New York 12, N. Y.
Running time recorders

Hedin Tele Technical Corp., 12 Carlton Ave., Little Falls, N. J.

Heil Scientific, Inc., 214 S. 4 St., St. Louis 2, Mo.
Laboratory supplies

Heiland Div., Minneapolis-Honeywell, 5200 E. Evans Ave., Denver 22, Colo.
Complete dynamic recording systems, including oscillographs, bridge balance units, amplifiers
(See advertisement on page 28)

Heinemann Electric Co., P. O. Box 299, Trenton 2, N. J.

Heise Bourden Tube Co., Brook Rd., Newton, Conn.
Bourdon tube gauges (high precision) for fluid pressures
(See advertisement on page 172)

Heitz, Inc., Karl, 150 W. 54th St., New York 19, N. Y.

Helco Products Corp., 7832 Balboa Blvd., Van Nuys, Calif.
High precision wire-bound potentiometers to customer specifications only. Aircraft instrument conversions from visual to electrical readout

Heli-Coil Corp., Shelter Rock Lane, Danbury, Conn.

Helicoid Gage Div., American Chain & Cable Co., 929 Connecticut Ave., Bridgeport, Conn.
Gages for pressure, vacuum or compound service
(See advertisement on page 41)

Helio Instrument Co., Inc., 1 S. Reed St., E. Riverton, N. J.
Laboratory and industrial optical instrumentation and components

Helipot Div., Beckman Instrs., Inc., 916 Meridian Ave., South Pasadena 8, Calif.
Rheostats; voltage dividing resistors

Heller Co., Gerald K., 1 N. Carey St., Baltimore 23, Md.
Manual motor controls
(See advertisement on page 149)

Hellige, Inc., 877 Stewart Ave., Garden City, N. Y.
Scientific instruments; laboratory bacteriological supplies

Henderson & Co., H. B., East Liverpool, Ohio
Pyrometric cones

Henry Valve Co., Inc., 3215 North Ave., Melrose Park, Ill.
Control valves

Henschel Corp., 14 Cedar St., Amesbury, Mass.
Marine interior communication equipment; alarm and signal systems; industrial control equipment

Henson Co., Fred C., 3311 E. Colorado St., Pasadena 8, Calif.
Electroscopes; optical instruments and components; designers and builders of custom instruments

Henszey Co., Watertown, Wis.
Feed water meters; flow indicators; heat exchangers; boiler feed regulators; meters and flow indicators for corrosive chemicals

Herbach & Rademan, Inc., 1204 Arch St., Philadelphia 7, Pa.
Electronic equipment distributors

Herd, Harold H., 1830 Fletcher St., Pasadena, Calif.
Instrument scales and dials; photo-etched reticles

Herman Stone Co., see Mayne Products Co.

Hermaseal Co., Inc., 1101 Lafayette St., Elkhart, Ind.
Glass-to-metal seals

Hermes Engravers, Inc., 13-19 University Pl., New York 3, N. Y.

Hermetic Sealed Products Co., 39 S. Sixth St., Newark 7, N. J.

Hermetic Sealing Corp., 99 E. Hawthorne Ave., Valley Stream, L. I., N. Y.
Electrical and electronic test equipment

Herron Optical Co., 9117 S. Main St., Los Angeles 61, Calif.
Precision lenses, prisms and mirrors
(See advertisement on page 153)

Hetherington & Berner, 701 Kentucky Ave., Indianapolis 7, Ind.
Fluidometers

Hetherington Inc., 1200 Elmwood Ave., Sharon Hill, Pa.
Switches

Heusser Instrument Mfg. Co., 121 W. Malvern Ave., Salt Lake City 15, Utah
Analytical balances

Hevi-Duty Electric Co., 4212 W. Highland Ave., Milwaukee 1, Wis.
Electric furnaces

Hewlett-Packard Co., 275 Page Mill Road, Palo Alto, California
Test and measuring instruments: audio oscillators; voltmeters; signal generators; electronic counters, etc.

Hewson Co., Inc., 443 Broad St., Newark 2, N. J.
High voltage dc insulation test sets; process control systems; static detection and indicating instruments

Hexacon Electric Co., 161 W. Clay Ave., Roselle Park, N. J.
Electric soldering irons

Heyman Mfg. Co., 530 Michigan Ave., Kenilworth, N. J.
Inspection instruments

Hickok Electrical Instrument Co., 10519 Dupont Ave., Cleveland 8, Ohio
Electric indicating instruments; electronic test equipment
(See advertisement on page 2)

Hi-G, Inc., Bradley Field, Windsor Locks, Conn.
Relays

Hi-Grade Alloy Corp., 1236 S. Talman, Chicago 8, Ill.
Printed circuit solders and fluxes; solder preforms; alloys anodes

Hi-Q Div., Aerovox Corp., Seneca St., Olean, N. Y.
Capacitors and resistors

Hieatt Engineering Co., P. O. Box 349, Burbank, Calif.
Environmental testing equipment, except vibration-shock

Hiergesell & Sons, Wm., 295 Pearl St., New York 7, N. Y.
Thermometers and hydrometers

High Pressure Equipment Co., 1222 Linden Ave., Erie, Pa.

High Speed Hammer Co., Inc., 313 Norton St., Rochester 21, N. Y.
Wire stripping machines; precision drilling equipment

High Vacuum Equipment Corp., 349 Lincoln St., Hingham, Mass.
Vacuum pumps and gates; electrical feed-throughs; vacuum metallizing; impregnating and furnace units

High Voltage Engineering Corp., 7 University Road, Cambridge, Mass.
Van de Graaff particle and microwave linear accelerators

Hill & Co., E. Vernon, P. O. Box 189, Lake Geneva, Wisc.
Aerological instruments, accessories

Hills-McCanna Co., 3025 N. Western Ave., Chicago 18, Ill.
Diaphragm valves; metering and proportioning pumps

Hillyer Instrument Co., Inc., 54 Lafayette St., New York 13, N. Y.
Computers; automatic machine tool control systems

Hinde & Dauch, Sandusky, Ohio
Corrugated packing products

Hindley Mfg. Co., 51 Charles St., Valley Falls, R. I.

Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
High precision machine tools

Hitemp Wires, Inc., 26 Windsor Ave., Mineola, L. I., N. Y.

Hobbs Corp., J. W., 2048 Yale Blvd, Springfield, Ill.
Running time meters; pressure switches

Hogan Laboratories, Inc., 155 Perry St., New York 14, N. Y.
Computers; wave filters; chemical analyzers; densitometers; concentration recorders

Hoke Incorporated, S. Dean St. & Garrett Pl., Englewood, N. J.
Regulators; flowmeters; valves; stainless steel cylinders

Holtzer-Cabot Electric Div., National Pneumatic Co., Inc. 420 Lexington Ave., New York 17, N. Y.
Fractional-hp motors

Hoover Electronics Co., 3640 Woodland Ave., Baltimore 15, Md.
Specialized instrumentation systems including telemetering, analog to digital converters, wind tunnel instrumentation, and specialized test equipment

Hopkins Engineering Co., 12900 Foothill Blvd., San Fernando, Calif.
Miniature, high temperature capacitors of paper, plastic film, metallized plastic films; custom radio interference filters and supression devices

Hopp Press, Inc., 460 W. 34 St., New York 1, N. Y.
Nameplates, dial faces; scales; instruction plates

Hoskins Mfg. Co., Lawton Ave. & Buchanan St., Detroit 8, Mich.
Pyrometers; laboratory furnaces; thermocouples

Houston Technical Laboratories, 2424 Branard St., Houston 6, Texas
Gravity meters for geophysical prospecting

Howard Clock Products, Inc., 256 Charles St., Waltham, Mass.

Howard Industries, Inc., 1760 State St., Racine, Wisc.
Motors; generators; motor starters

Howe & French Inc., 99 Broad St., Boston 10, Mass.
Laboratory supplies

Howe Scale Co., Inc., Rutland, Vt.
Scales

Howell Elect. Motors Co., 408 N. Rosevelt Ave., Howell, Mich.

Howell Instrument Co., 3101 Trinity St., Fort Worth, Texas
Electrical and electronic instruments; automatic regulators; potentiometers

Howland Optical Co., 29 Cottage Place, Nutley 10, N. J.
Optical flats; lenses; magnifiers

Hubbell Metals, Inc., 2817 Laclede Ave., St. Louis 3, Mo.

Hudson Radio & Television Corp., 37 65th St., New York 23, N. Y.
Electrical and electronic instruments and supplies

Hufco Industries, 2815 W. Olive St., Burbank, Calif.
Relays

Hughes Products Div., Hughes Aircraft Co., Los Angeles 45, Calif.
Electronic circuit components; semiconductor; cathode ray tubes

Hulcher Co., Inc., Charles A., 40 Manteo Ave., Hampton, Va.
High-speed cameras; stroboscopic light sources

Hull Mfg. Co., P. O. Box 246, Warren, Ohio
Compasses

Humboldt Mfg. Co., 2014 N. Whipple St., Chicago 47, Ill.
Cement and Concrete testers

Humphrey Products Div. of General Gas Light Co., 202 N. Park St., Kalamazoo, Mich.
High sensitivity valves

Hunt & Son, Inc., P. O. Box 337, Salem, Ohio
Electrically-operated, diaphragm, solenoid, and high pressure valves

Hunter Manufacturing Co., 930 S. Linn St., Iowa City, Iowa
Electronic counters, timers; interval controls; photocontact relays; sound-operated relays

Hunter Spring Co., Lansdale, Pa.
Special springs

Hupp Electronics Co., Div. of Hupp Corp., P. O. Box 513, Carlisle, Pa.
Photocells (cadmium sulphide); quartz frequency control crystals; miniature motors; remote selective switching systems and telemetering systems

Hupp Instrumentation, 2119 Sepulveda Blvd., Los Angeles 25, Calif.
Electronic digital counting instruments for time and frequency measurement or preset control applications

Huppert Co., K. H., 6830-32 S. Cottage Grove Ave., Chicago 37, Ill. Laboratory furnaces

Hy-Pro Tool Co., P. O. Box 945, New Bedford, Mass. Metal cutting tools

Hycon Electronics, Inc., 321 S. Arroyo Parkway, Pasadena 1, Calif.
Rack-mounted oscilloscopes, digital voltmeters, color bar dot generator, and color scope.

Hycor Division of International Resistance Co., 12970 Bradley Ave., Sylmar, Calif.

Hyde Instrument Corp., 2377 E. Washington St., Pasadena 7, Calif.
Optical gages; surveying instruments

Hydraulic Controls Co., Inc., 87 Terrace St., Roxbury 20, Boston, Mass.
Hydraulic and mechanical servomechanisms; components; solenoid valves

Hydromatics, Inc., 40 Factory St., Cedar Grove, N. J.
Valves and valve operating devices

Hydroway Scales, 20624 W. 8 Mile Rd., Detroit 19, Mich.
Indicating scales

Hygrotester Inc., P. O. Box 923, Brooklyn 1, N. Y.
Electronic equipment distributor

I

I-L-S Instrument Corp., 10701 Briggs Rd., Cleveland 11, Ohio

Electrical and electronic instruments: power supplies; counters; speed indicators

I.T.E. Circuit Breaker Co., 19th & Hamilton Sts., Philadelphia 30, Pa.
Fixed and variable resistors; manganin resistors; switchgear

Ideal-Aerosmith, Inc., 12909 Slerise Ave., Hawthorne, Calif.
Aircraft instrument test apparatus; sensitive needle valves

Ideal Industries, Inc., 1420 Park Ave., Sycamore, Ill.
Insulation testers; revolution counters

Illinois Coil Spring Co., 2100 N. Major Ave., Chicago 39, Ill.

Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago 10, Ill.
Temperature, air and dewpoint measuring and controlling instruments
(See advertisement on page 25)

Illinois Tool Works, Licon Switch and Control Div. 2301 N. Keeler Ave., Chicago 39, Ill.
Sensitive and limit precision switches

Imetra Co., Ltd., 136 Liberty St., New York 6, N. Y.
Instrument pivots and bearings

Impact Register Co., P. O. Box 445, Champaign, Ill.
Instruments for determining and recording impacts received by railroad cars and riding qualities of railroad cars, automobiles

Impact-O-Graph Corp., 1900 Euclid Ave., Cleveland 15, Ohio
Impact recorders

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7, Ill.
Fittings, tubing cutters and benders

Imperial Molded Products Corp., 2927 W. Harrison St., Chicago 12, Ill.

Imtra Corp., 58 Charles St., Cambridge 41, Mass.
Stepping and telephone relays; Tension gages

Indiana Gear Works, Inc., 1458 E. 19th St., Indianapolis 7, Ind.
Helicopter transmissions; aircraft actuators; ultra precise gearing

Indiana Steel Products Co., Valparaiso, Ind.
Alnico permanent magnets; cunife, indox ceramic magnets, and miscellaneous
(See advertisement on page 141)

Indikon Co., 76 Coolidge Hill Rd., Watertown 72, Mass.
Electrical instruments; gaging devices; data-handling and remote control systems

Indicating Calipers Corp., 1359 York Ave., New York 21, N. Y.
Indicating calipers
(See advertisement on page 96)

Induction Motors Corp., 570 Main St., Westbury, L. I., N. Y.
Precision ac and dc sub-fractional servo, and gear motors; fans; blowers; dynamotors
(See advertisement on page 43)

Industrial Cold Co., 1000 E. McNichols Rd., Detroit 3, Mich.
Low-temperature and altitude test chambers

Industrial Condenser Corp., 3243-65 N. California Ave., Chicago 13, Ill.
Oil paper and electrolytic capacitors

Industrial Control Co., Straight Path and Arlington Ave., Wyandanch, L. I., N. Y.
Electrical instruments; servo amplifiers

Industrial Control Panel Co., 517 W. Monroe St., Chicago 6, Illinois
Automatic control systems and components

Industrial Devices, Inc., 22 State Rd., Edgewater, N. J.
Electrical measuring instruments; neon indicating signals

Industrial Electronic Controls Co., 2271 E. 14th St., Brooklyn 29, N. Y.
Control systems; relays; counters; alarms

Industrial Electronic Engineers 3973 Lankershim Boulevard, North Hollywood, Calif.
Electronic and digital computers; remote control weighing systems; relay switching systems

Industrial Electronics Co., Inc., Hanover, Mass.
Dimensional, smoke-density and liquid-level instruments

Industrial Electronics, Inc., 8060 Wheeler St., Detroit 10, Mich.
Electronic assemblies; automatic electronic gaging machines

Industrial Engineering Corp., 525 E. Woodbine, Louisville 8, Ky.
Designers, engineers, and builders of electronic and electrical functional test equipment; hydraulic component parts
(See advertisement on pages 174, 234)

Industrial Engineering Corp., Rea Bldg., Terre Haute, Ind.
Relays

Industrial Filter & Pump Mfg. Co., 5900 Ogden Ave., Chicago 50, Ill.
Salt spray testers

Industrial Gauges Corp., 1500 The Plaza, West Englewood, N. J.
Gaging and inspection devices; remote control equipment

Industrial Hardware Manufacturing Co., Inc., 109 Prince St., New York 12, N. Y.
Printed circuit, laminated, transistor and subminiature sockets; wired assemblies; metal and bakelite stampings

Industrial Instrument Corp., P. O. Drawer 152, Odessa, Texas
Flow meters; orifice plates and unions; thermowells; allied products

Industrial Instruments, Inc., 89 Commerce Rd., Cedar Grove, N. J.
Electric conductivity equipment, including industrial indicators, controllers, recorders; industrial and laboratory cells; soil moisture and fertilizer content; electronic test equipment
(See advertisement on page 23)

Industrial Jewel Bearing Co., Stockham Bldg., Morrisville, Pa.

Industrial Nucleonics Corp., 1205 Chesapeake Ave., Columbus 12, Ohio
Process control systems for the rubber, plastics, paper, metals, tobacco and other process industries

Industrial Pyrometer & Supply Co., Alton, Ill.
Thermocouples

Industrial Products Div., General Tire & Rubber Co., Wabash, Indiana

Industrial Scientific, Inc., 1014 Taylor St., Fort Worth 2, Texas
Laboratory supplies

Industrial Tectonics, Inc., 3684 Jackson Rd., Ann Arbor, Mich.
Special ball and roller bearings—non-magnetic, corrosion-resistant, heat-resistant, special designs; special material balls; master ball sets

Industrial Test Equipment Co., 55 E. 11th St., New York, N. Y.
Electrical testing equipment; generators; volt and watt meters
(See advertisement on page 159)

Industrial Timer Corp., 1407 McCarter Highway, Newark 4, N. J.
Industrial timers, motor driven, with automatic reset; controllers; signals; testing equipment for electrical parts (operation or life test)

Industro, Inc., 649 Broadway, New York 12, N. Y.
Electron tubes; transistors

Industrol Corp., 494 Westfield Ave., Roselle Park, N. J.
Air dryers and gas sample dryers

Industronics, Box 424, Arlington Heights, Ill.
Power supplies; generators; audio oscillators

Inertial Instruments, Inc., 2029 Broadway, Santa Monica, Calif.
Mass flowmeters

Inet Div., Leach Corp., 4441 S. Santa Fe Ave., Los Angeles 58, Calif.
Automatic regulators; power supplies; generators; rectifiers

Inferno Co., Box 1138, Shreveport 90, La.
Combustion instruments

Infilco Inc., P. O. Box 5033, Tucson, Arizona

Ingersoll-Rand Company, 11 Broadway, New York 4, N. Y.
Instrument air compressors

Inlaid Optical Corp., 1058 Broad St., Providence 5, R. I.

Insco Co., Div. of Barry Controls, Inc., Hollis St., Groton, Mass.
Design, development and manufacture of electromechanical apparatus; integrators; speed reducers

Instrof Corp., Collegeville 22, Pa.
Racks; housings; covers
(See advertisement on page 229)

Instron Engineering Corp., 2 Hancock St., Quincy 71, Mass.
Testing machines

Instru-Lec Corp., 520 Homestead Ave., Mt. Vernon, N. Y.

Precision, fine-pitch gears, gear boxes and trains

Instrument Associates, Great Neck Road, Great Neck, N. Y.
Aviation and ground instrumentation

Instrument Cases, Inc., 510 W. Garfield Ave., Glendale 4, Calif.
Standard instrumentation transit cases and combination cases

Instrument Components, Inc., Div. of Belock Inst. Corp., 111th St. & 14th Ave., College Point, N. Y.
Electromechanical components

Instrument Corp. of America, P. O. Box 37, Blacksburg, Va.

Instrument Development Labs., Inc., 67 Mechanic St., Attleboro, Mass.
Photoelectric color analyzers; digital converters

Instrument Development & Mfg. Corp., 3018 East Foothill Blvd., Pasadena 8, Calif.
Electronic engineering, development and manufacturing; electro-mechanical, mechanical engineering and manufacturing; bearings: precision, high temperature; of special design

Instrument Electronics Corp., 90 Main St., Port Washington, N. Y.
Vacuum-tube voltmeters

Instrument Electronics Corp., 104 W. Jefferson St., Falls Church, Va.
Electronic instruments

Instrument Engineering Service, R. 3, Box 345, Michigan City, Ind.
Gas analysis and combustion instrumentation

Instrument Gear Works, 2815 W. Irving Park Rd., Chicago 18, Ill.
Standard and special small gears
(See advertisement on page 118)

Instrument Laboratories, 315 W. Walton Place, Chicago 10, Ill.
Electrical testing sets
(See advertisement on page 79)

Instrument Laboratory, Inc., P. O., 126 Elliott Ave., Seattle 99, Washington
Millivolt-type indicating pyrometers; salinity equipment for marine application; electromagnet balances for wind tunnel use; panels; graphic and non-graphic

Instrument Products, 2927 W. Harrison St., Chicago 12, Ill.

Instrument Resistors Co., 1036 Commerce Ave., Union, N. J.
Instrument resistors

Instrument Specialties Co., Inc., 231 Bergen Blvd., Little Falls, N. J.

Instrument Tool & Engrg. Corp., 2507 W. Harrison St., Chicago 12, Ill.

Instruments Corp., 4 N. Central Ave., Baltimore 2, Md.
Meteorological, hydrological and photogrammetric instruments

Instruments Inc., 122 N. Madison, Tulsa, Okla.
Level indicators and controllers—gamma ray, capacitance and pneumatically actuated

Instruments for Industry, Inc., 150 Glen Cove Rd., Mineola, L. I., N. Y.
IF broad band amplifiers

Insulated Circuits Inc., P. O. Box 73, Caldwell, N. J.

Insulation Manufacturers Corp., 565 W. Washington Blvd., Chicago 6, Ill.
Manufactures and distributors of electrical insulation materials

Insuline Corp. of America, 186 Granite St., Manchester, N. H.
Capacitance meters; electrical and electronic components

Intercontinental Dynamics Corp., 170 Coolidge Ave., Englewood, N. J.
Tension controls; temperature and humidity controls; ultra-low frequency random signal noise generators

Interelectronics Corp., 2432 Grand Concourse, New York 58, N. Y.
High fidelity audio equipment; power supplies
(See advertisement on page 165)

International Business Machines Corp., 590 Madison Ave., New York 22, N. Y.
Control systems; program controllers; time recorders; data-processing systems

International Correspondence Schools, Scranton 9, Pa.
Instrument education courses

International Crystal Mfg. Co., Inc., 18 N. Lee Ave., Oklahoma City, Okla.
Quartz crystals

International Decalcomania Co., 32 Union Square, New York 3, N. Y.
Nameplates; direction labels; quick application water slide materials

International Glass Corp., 5431 Tweedy Blvd., South Gate, Calif.
Glass: raw, optical and molded blanks

International Instruments Co., Canyon, Calif.
Process control devices; chemical instrumentation; relays; components

International Instruments Inc., P. O. Box 2954, New Haven 15, Conn.
Electrical and electronic instruments

International Microscope & Art Co., 7544 N. Ridge, Chicago 45, Ill.
Microscopes

International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
Nickel alloys

International Optical Co., Inc., 45 Urban Ave., New Cassel, Waterbury, L. I., N. Y.
Lenses for mechanical, electrical and optical instruments, fine reticle engraving on glass; glass, quartz, pyrex, metal lapping; military optics; mirrors
(See advertisement on page 155)

International Powder Metallurgy Co., 439 W. Main St., Ridgeway, Pa.
Powdered metal parts

International Products Corp., 2554 Greenmount Ave., Baltimore 18, Md.

International Radiant Corp., 40 Matinecock Ave., Port Washington, N. Y.
Testing chambers and ovens

International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif.
Photoelectric cells and dry disc rectifiers; sun batteries; germanium diodes and rectifiers
(See advertisement on page 183)

International Register Co., 2620 W. Washington Blvd., Chicago 12, Ill.
Coin meters—timers for electric ranges and gas ovens

International Research & Development Corp., 797 Thomas Lane, P. O. Box 1707, Columbus 16, Ohio

International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.
Metallized and wirebound fixed and variable resistors including high voltage and high frequency types

International Standard Trading Corp., 22 Thames St., New York 6, N. Y.
Electronic equipment distributor

International Telemeter Corp., 2000 Stoner Ave., Los Angeles 25, Calif.
Ceramic ferromagnetic cores for switching and storage; cores for magnetic read and record heads; television distribution system equipment

Ircal Industries, 2242 Sepulveda Blvd., Los Angeles 64, Calif.
Resistors

Islip Transformer and Metal Co., Inc., Foot of Beech St., Islip, N. Y.
Amplifiers

Isotope Products, Inc., 1700 Niagara St., Buffalo 7, N. Y.
Industrial instrumentation equipment utilizing radioactive isotopes to measure and control weight, mass, density, thickness and level

Ithaca Scientific Instrument Co., Ithaca, N. Y.
Drawing instruments

J

J B L Instrument Co., Sycamore & Mill Rd., Clifton Heights, Pa.
Rotary instrument switches; transformer tapping; railway signal gear; decade resistance boxes

J-B-T Instruments, Inc., 441 Chapel St., New Haven 8, Conn.
Vibrating reed frequency meters; elapsed time meters; rotary-selector switches; temperature measuring instruments
(See advertisement on page 248)

JFD Manufacturing Co., Inc., 6101 16th Ave., Brooklyn 4, N. Y.
Variable capacitors; quartz; dielectric materials

Jack Scientific Instrument Co., Bill, Solana Beach, Calif.
Cameras and camera control systems; programming and timing devices

Jackes-Evans Mfg. Co., 4427 Geraldine Ave., St. Louis 15, Mo.
Control valves

Jackson Co., Byron, 2010 Lincoln Ave., Pasadena 3, Calif.
Pressure and vacuum gages

Jackson Electrical Instrument Co., 18 S. Patterson Blvd., Dayton 2, Ohio
Radio & television testing equipment

Jacobs Instrument Co., 4718 Bethesda Ave., Bethesda 14, Md.
Electronic digital computers; navigational systems; delay lines; pulse generators; compact electronic counters; weapons and control systems

Jacoby-Tarbox Corp., 808 Nepperhan Ave., Yonkers, N. Y.
Moisture meters; rotameters; sight flow meters

Jadow Inc., B., 860 Broadway at 17th St., New York 3, N. Y.
Dimensional gaging equipment; special lubricants; fractional-hp motors
(See advertisement on page 222)

Jaeger Watch Co., Inc., 304 East 45th St., New York 17, N. Y.
Automobile clocks; timepieces for aviation and marine; chronomatic tachometers and true airspeed indicators

Jaegers Optical Corp., A., 691 Merrick Rd., Lynbrook, N. Y.
Achromatic objectives; prisms; eyepieces; first surface mirrors; etc.
(See advertisement on page 153)

Jaidinger Mfg. Co., 1921 W. Hubbard St., Chicago 22, Ill.
Temperature controllers; relays; switches

James Pond-Clark, 2181 E. Foothill Blvd., Pasadena 8, Calif.
Check valves; relief valves

James Vibrapowr Company, 4036 N. Rockwell St., Chicago 18, Illinois
Choppers; power supply vibrators

Jamesbury Corp., 62 Millbrook St., Worcester 5, Mass.

Jan Hardware Manufacturing Co., Inc., 75 N. 11th St., Brooklyn 11, N. Y.

Janson Gage Co., 7444 Beaverland, Detroit 39, Mich.
Gage block sets; sine bars; tri squares; accessories

Jared Services, Inc., 725 S. Erie St., Tulsa, Okla.
Electrical and electronic instruments; automatic control systems; components

Jarrell-Ash Co., 26 Farwell St., Newtonville 60, Mass.
Spectro-chemical analysis and X-ray diffraction instruments for use in metallurgy, research, quality control, trace element determinations, pathological investigations

Jarvis Co., Chas. L., Middletown, Conn.

Jarvis Electronics Corp., 6058 W. Fullerton Ave., Chicago 39, Ill.
Aircraft navigational instruments; resistors

Jarvis & Jarvis, Inc., 110 Pleasant St., Palmer, Mass.

Jeffrey Mfg. Co., P. O. Box 1879, Columbus 16, Ohio
Weighing, feeding, batching and proportioning equipment

Jeffries Transformer Co., 1710 E. 57th St., Los Angeles 58, Calif.

Jelliff Manufacturing Corp., C. O., P. O. Box 68, Southport, Conn.
Indicating comparators

Jelrus Co., Inc., 136 W. 52nd St., New York 19, N. Y.
Electric furnaces; temperature control devices

Jem O-Matic, Inc., 530 Cherry Lane, New Hyde Park, L. I., N. Y.

Jenkins Bros., 100 Park Ave., New York 17, N. Y.
Regulating valves

Jennings Radio Mfg. Corp., 970 McLaughlin Ave., San Jose, California
Vacuum capacitors; vacuum switches and relays; vacuum tube kilovolmeters

Jensen Tool Co., Henry C., 16 Mechanic St., Waltham, Mass.
Hairspring testers; toolmakers' test indicators

Jergbak-Bayless Co., Solon Rd., Solon, Ohio
Indicating comparators

Jerguson Gage & Valve Co., 87 Fellsway, Somerville 45, Mass.
Precision gages and valves
(See advertisement on page 133)

Jerrold Electronics Corp., 23rd & Chestnut St., Philadelphia 3, Pa.
RF amplifiers; rf meters; sweep frequency generators; communication measuring instruments

Jessop Steel Co., Washington, Pa.

Jessup Eng. & Dev. Co., 3980 Superior St., Cincinnati 36, Ohio
Dimensional equipment; orifice plates; regulators

Jowell Products, Inc., 5456 W. 111th St., Oak Lawn, Ill.
Liquid level alarms; magnetic proximity switches

Joline Tools, Inc., 8442 Otis St., South Gate, Calif.
Torque tools and accessories

Johanson Mfg. Corp., 10 Rockaway Valley Rd., Boonton, N. J.
Variable and precision capacitors

Johansson Gage Co., See Swedish Gage Co. of America

Johnson Co., E. F., Waseca, Minn.
Tube sockets; jacks; plugs; knobs and dials; indicators; capacitors; transmitters, am, fm & ssb

Johnson Corp., 805 Wood St., Three Rivers, Mich.
Automatic boiler controls; compressed-air cleaners

Johnson Engrg. Co., Inc., Welton V., 95 Summit Ave., Summit, N. J.
Instrument bearings; shafts; pivots; tubing; special lubricants
(See advertisement on page 162)

Johnson Gage Co., 534 Cottage Grove Rd., Bloomfield, Conn.
Comparators and gages

Johnson Gas Appliance Co., 565 E. Ave., N. W., Cedar Rapids, Iowa
Laboratory furnaces

Johnson Scientific Instrument Co., 2915 Maples Ave., Berwyn, Ill.
Biological instruments, instrument-repair tools

Johnson Service Co., 507 E. Michigan St., Milwaukee 2, Wisc.
Automatic temperature and humidity control for heating, cooling, ventilating, air conditioning and industrial processes
(See advertisement on page 22)

Johnson-Williams, Inc., P. O. Box 6, Sta. A, Palo Alto, Calif.
Combustible gas indicators and alarm systems, portable and continuous; including accessories
(See advertisement on page 117)

Johnston & Jennings Company, 877 Addison Rd., Cleveland 14, Ohio
Depth gages, valves

Jones Div., Howard B. Cinch Mfg. Co., 1026 S. Homan Ave., Chicago 24, Ill.
Connectors

Jones Electronics Co., M. C., 96 N. Main St., Bristol, Conn.
Standing wave meter

Jones & Lamson Machine Co., 160 Clinton St., Springfield, Vt.
Optical comparators

Jones Motrola Corp., 432 Fairfield Ave., Stamford, Conn.
Tachometers, speed indicators and speedometers

Jones Optical Works, A. D., 2400 Massachusetts Ave., Cambridge, Mass.
Lenses, light filters and optical parts; including fused quartz insulators; slides and cover slips of quartz and vycor, ground and polished
(See advertisement on page 152)

Jordan Electronics, Inc., 3025 W. Mission Rd., Alhambra, Calif.
Nuclear instruments for health monitoring systems, industrial control, and measurement

Jordan Regulator Corp., 6013 Wiehe Rd., Cincinnati 13, Ohio
Automatic controllers, governors and regulators; remote-control systems; laboratory apparatus

Jorgan Co., 65 Atlantic Ave., Rochester 7, N. Y.

Joy Manufacturing Co., Electrical Connector Div., 1201 Mackland Ave., St. Louis 10, Missouri
Electrical connectors; cable vulcanizers and fault finders
(See advertisement on page 86)

Joyro Associates, 488 Latham Road., Mineola, Long Island, N. Y.
Special slide rules

Judson-Bigelow, Inc., 171 Spring St., New York 12, N. Y.
Chart recording paper

K

K-F Development Co., 2606 Spring St., Redwood City, Calif.
Af and rf amplifiers

Kaar Engineering Co., 2995 Middlefield Rd., Palo Alto, Calif.
Radio and navigation instruments

Kahl Scientific Instrument Co., Box 1166, El Cajon, Calif.
Thermometers; hydrometers; psychrometers; hygrometers

Kahle Engineering Co., 1307 Seventh St., North Bergen, N. J.
Equipment for the manufacturing of electronic tubes, crystal diodes, lamps; coil winding equipment

Kahn and Co., Inc., 541 Windsor, Hartford 1, Conn.
Custom built hydraulic, pneumatic, and electrical-electronic test equipment

Kansas City Laboratory Supply Co., 307 Westport Road, Kansas City 11, Mo.
Laboratory supplies

Kanthal Corporation, 7 Amelia Place, Stamford, Conn.

Karn Chemical Equipment Co., 518 Dickson Ave., Pittsburgh 2, Penna.
Thermowells
(See advertisement on page 220)

Kates Co., W. A., 430 Waukegan Rd., Deerfield, Ill.
Automatic self-operated flow controllers
(See advertisement on page 108)

Kauffman-Lattimer Co., 230 N. Front St., Columbus 16, Ohio
Laboratory supplies

Kay Electric Co., 14 Maple Ave., Pine Brook, N. J.
Electronic Instruments

Kay Lab, 5725 Kearney Villa Rd., San Diego 11, Calif.
Commercial and industrial television equipment

Kaydel Moisture Gauges, 126 Liberty St., New York 6, N. Y.
Moisture meters

Kaye & MacDonald, Inc., 1115 Central Ave., West Orange, N. J.
Automatic controllers and regulators

Kearfott Company, Inc., 1378 Main Ave., Clifton, N. J.
High-precision servo system components; gyroscopic instruments; navigational systems based on gyros; airborne indicators for specific applications
(See advertisement on page 9)

Keckley Co., O. C., 3400 Cleveland St., Skokie, Illinois
Steam and liquid control equipment including precision pressure regulators, temperature regulators, float valves, strainers, safety valves and solenoid valves

Keim Precision Mirrors, 1346 E. Colorado St., Glendale 5, Calif.
High vacuum evaporated optical coating; filters; one-way mirrors

Keithley Instruments, Inc., 12415 Euclid Ave., Cleveland 6, Ohio
Electronic test instrumentation

Keller, Jr., Hugo P., 50 E. 42nd St., New York 17, N. Y.
Synthetic sapphire products; mercury
(See advertisement on page 129)

Keller Products, Inc., 41 Union St., Manchester, N. H.
Laminated products

Kelley-Koett Mfg. Co., Inc., Covington, Ky.
X-ray apparatus

Kellogg Switchboard & Supply Co., 79 West Monroe St., Chicago 3, Ill.
Relays; keyswitches; ac generators

Kelnor Mfg. Co., 222 Kearney St., San Francisco 2, Calif.

Kemlite Laboratories, 1819 W. Grand Ave., Chicago 22, Ill.
Condenser discharge flashtubes

Kemp Mfg. Co., C. M., 405 E. Oliver St., Baltimore 2, Md.
Air and gas dehydrators; inert gas generators; flame arrestors and fire checks

Kemtron Electron Products, Inc., 14 Prime Place, Newburyport, Mass.
Silicon and germanium diodes

Kendall Controls Corp., 144 Moody St., Waltham, Mass.
Valve-operating devices; control valves; automatic controllers

Kendrick & Davis Co., Lebanon, N. H.
Instrument tools; countersinks and counter bores; fractional-hp motors

Ken-Rad Tube Lamp Co., Owensboro, Ky.

Kent Cliffs Laboratories, Div. Torsion Balance Co., Monhegan Ave., Clifton, N. J.
Hardness testers; laboratory, analytical, precision, and pharmaceutical balances and weights

Kenyon Transformer Co., Inc., 840 Barry St., New York 59, N. Y.
Instrument and power transformers; filters; chokes

Kepco Laboratories, 131-38 Stanford Ave., Flushing 55, L. I., N. Y.
Power supplies, ac and dc; electronic equipment

Kessler Co., Frank, 41-45 Forty-seventh St., Long Island City 4, N. Y.
(See advertisement on page 226)

Kessler Co., Walter H., 180 Lafayette St., New York, N. Y.
Thermometers and hydrometers

Kester Solder Co., 4201 Wrightwood Ave., Chicago 39, Ill.
Cored solders; solder preforms

Keuffel & Esser Co., Adams & Third Sts., Hoboken, N. J.
Surveying instruments

Kewaunee Mfg. Co., End So. Center St., Adrian, Mich.
Laboratory furniture

Key Electric Corp., 287 Post Ave., Westbury, L. I., N. Y.
Digital magnetic tape recorders

Keystone Carbon Co., Inc., Saint Marys, Pa.
Carbon resistors

Keystone Electronics Co., 65-67 7th Ave., Newark, N. J.

Keystone Products Co., 904-6 Twenty Third St., Union City, N. J.
Power supplies; transformers; magnetic amplifiers; components

Kieley & Mueller Inc., 64 Genung St., Middletown, N. Y.
Automatic diaphragm control valves; pressure regulators; float valves; liquid level displacement controllers
(See advertisement on page 29)

Kimberly Clark Corp., Neenah, Wis.

Kimble Glass Co., Vineland, N. J.
Glass apparatus; glass tubing; thermometers; hydrometers

Kinetic Engineering Co., M-217, Delaware Trush Bldg., Wilmington 1, Del.
Flow-rate and proportioning measurement and control equipment.

Kinetic Instrument Co., 1418 Arbor Ave., Highland Park, Ill.
Laboratory apparatus; electrical and electronic instruments; relays

Kinetix Inst. Div., Ketay Instrument Corp., Commack, L. I., N. Y.
Servomotors; resolvers; synchros

Kinevox Div. of Electromation Co., 116 S. Hollywood Way, Burbank, Calif.
Synchronous magnetic film recorders; reproducers; bulk sound erasers; associated magnetic recording equipment

King Engineering Corporation, 3201 S. State St., Ann Arbor, Mich.
Manometers; pressure instruments
(See advertisement on page 144)

King Gem Co., Gellatin Gabway, Mont.

King Tester Corp., 440-44 N. 13th St., Philadelphia 23, Pa.

Kinney Manufacturing Div., New York Air Brake Co., 3529 Washington St., Boston 30, Mass.
Vacuum pumps and valves

Kirchberger & Co., Inc., M., 85 W. Forest Ave., Inglewood, N. J.

Kirk & Blum Manufacturing Co., 3120 Forrer St., Cincinnati 9, Ohio
Instrument panels and sheet metal assemblies; air supply, fume exhaust, dust control, dust collection systems; laboratory and production industrial ovens
(See advertisement on page 4)

Kirkland Co., H. R., 10 King St., Morristown, N. J.
Bulls eye lenses; indicating lamps; pilot lights; push button switches; annunciators

Kistler Instrument Co., 15 Webster St., Tonawanda, N. Y.
High precision quartz transducers and servo-type instruments for measuring static and dynamic pressures, forces, accelerations, vibrations and loads
(See advertisement on page 174)

Kleinschmidt, Inc., County Line Rd., Deerfield, Ill.
Data processing equipment; digital readouts

Klett Mfg. Co., 179 E. 87th St., New York 28, N. Y.
Colorimeters

Klipfel Valves, Inc., Div. of Hamilton-Thomas Corp., 1075 Lincoln Ave., Hamilton, Ohio
Automatic regulating valves

Knights Company, James, Sandwich, Ill.
Crystals

Knopp Inc., 4224 Holden St., Oakland 8, Calif.
Voltage testers; phase sequence indicators; precision multi-range current transformers; potential transformer testing equipment; battery chargers

Koch & Co., F. A., 72 Spring St., New York 12, N. Y.
Laboratory supplies

Koch & Sons, H., Corte Madera, Calif.
Fiberglas products

Kocour Co., 4800 S. St. Louis, Chicago 32, Ill.
Dimensional, chemical and electrical instruments

Koehler Instrument Co., Inc., 168-56 Douglas Ave., Jamaica 33, N. Y.
Petroleum and paint testing equipment; polariscope tubes and accessories
(See advertisement on page 159)

Kohler Co., P. O. Box A, Kohler, Wisconsin
Valves and valve-operating devices

Koiled Kords, Inc., Box K, Hamden, Conn.

Kollmorgen Optical Corp., 348 King St., Northampton, Mass.
Submarine and Industrial periscopes; borescopes; projection lenses; fire control devices for armed forces, viewing scopes; rifle scopes
(See advertisement on page 98)

Kollsman Instrument Corp., 80-08 45th Ave., Elmhurst 73, Long Island, N. Y.
Precision instruments for aircraft

Kontes Glass Co., Spruce St., Vineland, N. J.
Glass apparatus, instruments and parts

Kopp Scientific Inc., 15 Park St., Springfield, Mass.
Microchemical and micromechanical apparatus; blood-test apparatus; automatic time switches

Krembs & Co., 669 W. Ohio St., Chicago 10, Ill.
Fluxes for soldering, brazing and welding, coated welding electrodes.

Krohn-Hite Instrument Co., 580 Massachusetts Ave., Cambridge 39, Mass.
Oscillators; square wave generator; variable electronic filters; ultralow distortion power amplifiers; regulated power supplies

Krouse Testing Machine Inc., 573 E. 11th Ave., Columbus 3, Ohio
Fatigue testing machines

Kruger Instruments, Harold, P. O. Box 164, San Gabriel, Calif.
Mercury vapor detectors; ultraviolet photometers; gas-analyzers; spectrophotometers

Kulka Electric Mfg. Co., 633 So. Fulton Ave., Mt. Vernon, N. Y.

Kurman Electric Co., Inc., 191 Newel St., Brooklyn, N. Y.
Relays; vibrators; electronic control devices

Kurz-Kasch, Inc., 1421 So. Broadway, Dayton 1, Ohio

Kushner Laboratories, Joseph B., 115 Broad St., Stroudsburg, Pa.
Surface tension measuring instruments

Kwikheat Manufacturing Co., 3732 San Fernando Rd., Glendale 4, Calif.
Soldering irons

Kybernetes Corp., 9 E. 40th St., New York 16, N. Y.
Scanning systems; annunciators; process measurement and control equipment and components

L

L. A. B. Corp., P. O. Box 278, Skaneateles, N. Y.
Vibration Test equipment; torque measuring dynamometers

L and L Manufacturing Co., 804 Mulberry St., Upland, Chester, Pa.
Electric furnaces and ovens
(See advertisement on page 115)

L & O Research & Development Corp., 134 N. Wayne Ave., Wayne, Pa.

L & R Manufacturing Co., 577 Elm St., Arlington, N. J.
Precision instrument cleaning machines; cleaning and rinsing compounds; fractional-hp motors

Labline, Inc., 3070 W. Grand Ave., Chicago 22, Ill.
Laboratory apparatus; testing equipment; components

Laboratory Construction Co., 1113-15 Holmes St., Kansas City 6, Mo.
Laboratory furniture and apparatus

Laboratory for Electronics, Inc., 75 Pitts St., Boston 14, Mass.
Oscilloscopes; digital voltmeters and frequency meters; microwave oscillators; portable GCA radar equipment

Laboratory Equipment Corp., Box 151, St. Joseph, Mich.
Carbon and sulphur determinators

Laboratory Furniture Co., Inc., Old Country Road, Mineola, L. I., N. Y.
Laboratory furniture

Laboratory Materials Co., 7319 Vincennes Ave., Chicago 21, Ill.
Laboratory supplies

Laboratory of Electronic Engineering, Inc., 413 L. St., N. W., Washington 1, D. C.
Regulated power supplies

Laboratory Optical Co., U. S. Highway 22, Plainfield, N. J.
Optical inspection instruments; components; cameras

Lab-Tronics, Inc., 1115 W. Washington Blvd., Chicago 7, Ill.

Laboratory apparatus; electrical and electronic instruments; components

Lafayette Instrument Co., N., 26 St., Layfayette, Ind.
Electrical and electronic instruments; motors; optical projectors; lie detectors; special timepieces

Lake Erie Electric Mfg., Inc., 2952 W. 22nd St., Erie, Pa.
Relay control equipment; electric switch boards and panel boards

LaMarche Mfg. Co., 9216 W. Grand Ave., Franklin Park, Ill.
Constant voltage regulators, rectifiers

Lamb Electric Co., Lake St., Kent, Ohio
Fractional-hp motors

Lambda Electronics Corp., 11-11 131st St., College Point 56, New York
Power supplies

Lammert & Mann Co., 260 N. Woods St., Chicago 12, Ill.
Vacuum pumps; air compressors

La Motte Chemical Products Co., Towson, Md.
pH control equipment; chemical controls; special reagents for research and analylsis; soil testing equipment

Lampkin Laboratories, Inc., Bradenton, Fla.
Radio-frequency meters; modulation meters

Lancaster Lens Co., 220-226 W. Main St., Lancaster, Ohio
Electronic and industrial glassware; lenses; reflectors; glass and plastic parts

Lance Products, P. O. Box 251, Forest Hills 75, N. Y.
Adjustable frequency vibration tables; portable vibration amplitude meter

Land-Air, Inc., 201 No. Wells Street, Chicago 6, Ill.
Aircraft flight analyzers; hazardous gas detectors; reed electrometers

Landis & Gyr, Inc., 45 West 45th St., New York 36, N. Y.
Electric integrating meters; indicating and graphic demand meters for KW, KVA, reactive; prepayment meters; totalizing and remote; time switches; motor wound escapement or synchronous motor types with astronomic dials; miniature ball bearings

Landis Machine Co., 5th & Church Sts., Waynesboro, Pa.

Landsverk Electrometer Co., 550 W. Garfield Ave., Glendale 4, Calif.
Instruments and special components for X-ray and radioactivity measurements, including neutron dosimeters, standard roentgen meters
(See advertisement on page 181)

Langevin Mfg. Corp., 47-37 Austell Pl., Long Island City, L. I., N. Y.
Power supplies; transformers

Lansdale Tube Co., Div. of Philco Corp., Lansdale, Pa.
Surface barrier transistors; junction transistors; VHF tuner diodes; X-band mixer diodes; subminiature tubes; receiving tubes; cathode-ray tubes

LaPine & Co., Arthur S., 6001 S. Knox Ave., Chicago 29, Ill.
Laboratory supplies

Lapp Insulator Co., Inc., Process Equipment Division, 39 Gilbert St., Le-Roy, N. Y.
Automatic feeders and regulators; pumps; laboratory ware

Larrimore Sales Co., P.O. Box 1234, St. Louis 1, Mo.
Magnifiers

Larson Instrument Co., 24 Orchard St., Tarrytown, N. Y.
Combustion control equipment; electrical test instruments; remote control equipment; relays; time; temperature recorders and controllers

LaValee & Ide, Inc., Grape St., Chicopee, Mass.

Lavoie Laboratories, Matawan Freehold Rd., Morganville, N. J.
Ultra high frequency; precision frequency meters

Lawrence & Hill, Inc., 142 Main Ave., Watertown, N. Y.
Gages and gaging fixtures

Lawter Chemicals, Inc., 3563 Touhy Ave., Chicago 45, Ill.
Luminous and fluorescent chemicals and coatings

Leach Relay Co., 5915 Avalon Blvd., Los Angeles [illegible], Calif.

Lear, Inc., 3171 S. Bundy Dr., Santa Monica, Calif.
Electronic and mechanical aircraft accessories; aircraft radio equipment; radio compasses, etc.

Lectrohm, Inc., 5560 Northwest Highway, Chicago 30, Ill.
Wire wound resistors

Lectronic Research Labs., 715 Arch St., Philadelphia 6, Pa.
Electrical and electronic components; motors; cathode-ray tubes

Ledeen Mfg. Co., 3350 North Gilman Rd., El Monte, Calif.
Automatic control valves; air-hydraulic aircraft test stands

Lee Spring Co., Inc., 30 Main St., Brooklyn 1, N. Y.
Solenoids

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia 44, Pa.
Electrical measuring instruments for laboratory & plant Speedomax recorders; Centrimax flowmeters and Metermax combustion control systems

Leetronics Div., Lee Spring Co., Inc., 30 Main St., Brooklyn 1, N. Y.
Rotary solenoids; stepping switches

Lehigh Chemical Co., Chestertown, Maryland
Lubricants
(See advertisement on page 135)

Leighton Labs., H. W., Sunset Lane & York Rd., Hatboro, Pa.
Geiger Mueller tubes; health-monitoring chambers

Leiman Bros., Inc., 191 Christie St., Newark 5, N. J.
High vacuum pumps

Leitz Inc., E., 468 Fourth Ave., New York, N. Y.
Optical instruments

Leland Inc., G. H., 123 Webster St., Dayton 2, Ohio
Circuit selector switches, stepping relays, rotary solenoids

Lem[illegible] Engineering Co., Inc., 201 E. Jefferson St., Plymouth, Ind.
Riveters; custom and special fastening machines

Lenkurt Electric Co., 1105 Country Road, San Carlos, Calif.
Ultrasonic-frequency transformers, metallic dust cored; inductors; electric wave filters

Lennard & Co., Inc., P. M., P. O. Box 56, Village Station, New York, N. Y.
Dust and humidity control hoods

Lenox Instrument Co., 2010 Chancellor St., Philadelphia 3, Pa.
Optical and technical instruments

Lenz Electric and Manufacturing Co., 1751 N. Western Ave., Chicago 47, Ill.
Wire, cable; cable harness assemblies, etc.

Lepel High Frequency Labs., Inc., 55th St. & 37th Ave., Woodside 77, N. Y.
Laboratory furnaces; high-frequency apparatus

Lerco Electronics, Inc., 501 S. Varney St., Burbank, Calif.
Terminals; terminal boards; insulated feed-thrus and stand-offs; eyelets; small connectors; electronic hardware items
(See advertisement on page 80)

Leroy M. E. Clausing Co., 8038 Monticello Ave., Skokie, Ill.
Coatings by high vacuum process — Beral, aluminum, copper, gold, platinum, transparent mirrors; precision optical components — Schmidt systems, paraboloidal, spheroidal, hyperboloidal; optical flats

LeRoy Maugans Leather Co., 1403 Lincoln St., Anderson, Ind.

Leslie Co., Grant Ave., and Val Brook Ave., Lyndhurst, N. J.
Pressure reducing valves; pump governors; temperature regulators; pressure controllers

Lessells & Associates, Inc., 916 Commonwealth Ave., Boston 15, Mass.
Special testing machines; electrical and mechanical control systems; strain gage instrumentation

Leupold & Stevens Instruments, Inc., 4445 N.E. Glisan St., P. O. Box 5082, Portland 13, Ore.
Recorders and indicators, for irrigation, power, waterworks, sewerage; equipment for hydraulic laboratories; snow-rain recorders; hydrographic accessories; transits; levels

Levin & Son., Inc., Louis, 3610 South Broadway, Los Angeles 7, Calif.
Instrument lathes; micro-drill presses; watchmaker's tools

Levinthal Electronic Products, Inc., 2821 Fair Oaks Ave., Redwood City, Calif.
Radio and high-voltage power supplies; modulators; microwave transmitter systems; scintillation crystals; medical electronic instrumentation

Levy & Co., Max, Wayne Ave. & Berkley St., Philadelphia 44, Pa.
Precision rulings on glass; scales; grids; reticles; graticles
(See advertisement on page 192)

Lewis & Co., J. B., 3324 Main St., Hartford 5, Conn.
Motor controls; adjustable speed-electronic exciters

Lewis Engineering Co., 52 Rubber Ave., Naugatuck, Conn.
Aircraft temperature instruments; selector switches; connector blocks; thermocouples; resistance bulbs; portable pyrometer and test potentiometers; thermocouple wire; special cables and wire
(See advertisement on Back Cover)

Lewis Spring and Mfg. Co., 2648 W. North Ave., Chicago 47, Ill.
Light, precision compression, extension and torsion springs; wire forms and light stampings
(See advertisement on page 199)

Lewis & Kaufman, Ltd., P. O. Box 337, Los Gatos, Calif.
Electron tubes

Librascope, Inc., 808 Western Ave., Glendale 1, Calif.
Navigation, gun fire, bombing and fire control systems; computers; data handling systems

Librascope, Inc., Burbank Div., 133 E. Santa Anita, Burbank, Calif.
Magnetic digital computing components

Liebel-Flarsheim Co., 111 East Amity Rd., Cincinnati 15, Ohio
Automatic time control equipment

Lindberg Engineering Co., 2450 W. Hubbard St., Chicago 12, Ill.

Lindberg Products Co., P. O. Box 908-C, Lakeport, Calif.
Sandblast guns for laboratory or shop
(See advertisement on page 10)

Linde Air Products Co., A Division of Union Carbon and Carbide Corp., 30 E. 42nd St., New York 17, N. Y.
Gas gages; gas flowmeters; oxygen regulators

Lindly & Co., 248 Herricks Rd., Mineola, L. I., N. Y.
Optical components; illuminators

Lindsay Products, Inc., 11601 Jefferson Blvd., Culver City, Calif.
Small and miniature, permanent magnet and other electrical dc motors

Linear Equipment Labs., 380 Oak St., Copiague, N. Y.
Signal generators; baluns; h-v and h-f probes and components

Link Aviation Inc., Binghamton, N. Y.
Aircraft navigational instruments

Linear, Inc., State Rd. & Lerick St., Philadelphia 35, Pa.

Link Engineering Co., 13845 Elmira St., Detroit 27, Mich.
Spring testers

Liquidometer Corp., 36-16 Skillman Ave., Long Island City 1, N. Y.
Liquid level gages

Liquid Scale Gauge Co., 100 N. First St., Minneapolis 1, Minn.
Liquid level indicating gages

Liquidvision Gauge & Control Corp., P. O. Box 51, Oceanside, L. I., N. Y.
Level measurement and control equipment

Littelfuse Inc., 1865 Miner St., Des Plaines, Ill.
Low amperage precision fuses and fuse mountings

Little, Inc., Arthur D., Memorial Drive, Cambridge 42, Mass.
Chemical feeds and special equipment

Little Falls Alloys Co., Inc., 181 Caldwell Ave., Paterson, N. J.
Special, non-ferrous, spring, and electric and electronic wire

Littleford Bros., 453 E. Pearl St., Cincinnati 2, Ohio
Control boards and housings

Litton Industries, 1049 Brittan Ave., San Carlos, Calif.

Livermont, Inc. Myrtle and Maple Aves. Monrovia, Calif.
Positive torque control clutches for power screwdrivers and measuring instruments

Logan Engineering Co., Aridifier Div., 4901 W. Lawrence Ave., Chicago 30, Ill.
Compressed air and gas separators

Logansport Machine, Inc., 40 Payson Rd., Logansport, Ind.

Logeman Co., C. W., 633 Bergen St., Brooklyn 38, N. Y.
Metering and proportioning pumps; homogenizers

Logistics Research Co., 141 So. Pacific Ave., P. O. Box 431, Redondo Beach, Calif.
Automatic digital graph plotters and followers; photoelectric controls

Lonergan Co., J. E., 205 Race St., Philadelphia 6, Pa.
Pressure gages

Loral Electronics Corp., 794 E. 140th St., New York 54, N. Y.
Remote and machine control equipment; digital computers

Lord Mfg. Co., 1635 W. 12th St., Erie 6, Pa.
Bonded rubber vibration isolation mountings and flexible couplings for practical horsepower motors

Los Angeles Scientific Instr. Co., 2451 Riverside Dr., Los Angeles 39, Calif.
Planimeters; integrators; collimators; pantographs; optical testing instruments
(See advertisement on page 163)

Loudon Instr. Div., See Land-Air, Inc.

Lucifer Furnaces, Inc., Neshaminy, Pa.
Furnaces and ovens

Ludwig Inc., F. G., Coulter Rd., Old Saybrook, Conn.
Photocopying machines

Lufkin Rule Co., 1730 Hess Ave., Saginaw, Mich.
Precision tools and measuring tapes

Lumenite Electronic Co., 407 S. Dearborn St., Chicago 5, Ill.
Photoelectric controls

Luther Manufacturing Co., 7312 Varna Ave., N. Hollywood, Calif.
Electronic and instrument components; motors; syncros; relays; electric and electronic windings

Lux Clock Mfg. Co., 95 Johnson St., Waterbury 20, Conn.
Automatic timers and clock mechanisms

Lyman Electronic Corp., 12 Cass St., Springfield, Mass.
Radio test instruments

Lynn, Robert M., P.O. Box 745, Arcadia, California
Optical parts; optical tools; toolmakers microscopes; interference filters; iris diaphragms

Lynn Electronic Research Co., 9 W. Magnolia Blvd., Burbank, Calif.

M

MB Mfg. Co., A division of Textron American, Inc., 1060 State St., New Haven 11, Conn.
Electrical instruments

M and G Instrument Co., 12940 Saticoy St., N. Hollywood, Calif.
Micrometers; dial indicators

Macalaster Bicknell Co., 243 Broadway, Cambridge 39, Mass.
Laboratory glass apparatus

Macallen Co., Macallen St., Boston, Mass.

Macarr, Inc., 2543 Boston Rd., Bronx, N. Y.
Power supplies; components

Macbeth Corp., Little Britain Rd., Newburgh, N. Y.
Hydrogen ion meters

Macbeth Daylighting Corp., 227 West 17 St., New York 11, N. Y.
Daylight lamps for titration and color matching

Machine Specialties, 4027-33 N. Kedzie Ave., Chicago 18, Ill.
Machinery Electrification, Northboro, Mass.
Remote and machine tool control systems; graphic panels

Machlett Laboratories, Inc., Springdale, Conn.
Vacuum tubes

Machlett & Son, E., 220 East 23rd St., New York 10, N. Y.
Laboratory apparatus and supplies

Mack Electric Devices, Inc., 38 Glenside Ave., Wyncote, Pa.
Relays; vacuum switches; temperature alarms
(See advertisement on page 188)

MacKenzie Walton Co., 478 Pawtucket Ave., Pawtucket, R. I.
Seamless, precision tubing

MacLeod & Hanopol, 10 Roland St., Charlestown 29, Mass.
Radio testing instruments

Magnaflux Corp., 7300 W. Lawrence Ave., Chicago 31, Ill.
Nondestructive testing equipment and materials: magnetic particle, fluorescent magnetic particle, fluorescent penetrant, dye penetrant, ultrasonic, electronic and Eddy current methods

Magnatran Incorporated, 248 Schuyler Ave., Kearny, N. J.
Transformers; magnetic components

Magnatrol Valve Corp., 67 Fifth Ave., Hawthorne, N. J.
Valves, solenoid; sizes from ¼" to 3", packless construction, normally closed or normally open type; pressures to 300 psig
(See advertisement on page 236)

Magnavox Co., Inc., 2131 Bueter Rd., Fort Wayne 4, Indiana
Electrolytic capacitors

Magnecord Inc., 1101 S. Kilbourn Ave., Chicago 24, Ill.
Magnetic tape recorders

Magnecraft Electric Co., 1442 West Van Buren St., Chicago 7, Ill.
Relays

Magnet Wire Division, Essex Wire Corp., Ft. Wayne, Ind.
Magnet wire; bare copper and aluminum wire

Magnetic Amplifiers Inc., 632 Tinton Ave., New York 55, N. Y.
Telemetering components, magnetic tape recorders; power supplies; analog computers

Magnetic Analysis Corp., 42-44 12th St., Long Island City 1, N. Y.
Magnetic inspectors for steel bars and tubing, (including stainless steel); comparators for ferrous and non-ferrous materials; demagnetizers
(See advertisement on page 141)

Magnetic Industries, Inc., 2640 Huldy St., Houston, Texas
Magnetic amplifiers; servomechanisms

Magnetic Instrument Co., 82 Main Street, West Orange, N. J.
Electrical measurement and control equipment; components

Magnetic Research Corp., 202 Center St., El Segundo, Calif.
Power supplies, magetic amplifiers, magnetic converters for dc; line voltage regulators for ac; magnetic servo amplifiers, pulse generators, trigger generators
(See advertisement on page 65)

Magnetics, Inc., P. O. Box 391, Butler, Pa.
Computer memory cores; magnetic shields and laminations

Magnetrol, Inc., 2110 S. Marshall Blvd., Chicago 23, Ill.
Liquid level and flow controls,—pneumatic or electric
(See advertisement on page 133)

Maguire Industries, See Thordarson-Meissner

Mahady Co., E. F., 857 Boylston St., Boston 16, Mass.
Laboratory supply house

Malco Tool & Mfg. Co., 4025 West Lake Street, Chicago 24, Ill.
Instrument and electronic hardware

Mallory & Co., Inc., P. R., 3029 E. Washington St., Indianapolis 6, Ind.
Dry batteries; electrolytic capacitors; electrical contacts; special metals; power supplies

Mallory & Co., Inc., P. R., Battery Div., N. Tarrytown, N. Y.
Mercury batteries

Mann Co, Wm. I., 116 W. Foothill Blvd., Monrovia, Calif.
Precision optics; custom electronic components; scientific equipment and instruments

Manning, Maxwell & Moore, Inc., 250 E. Main St., Stratford, Conn.
Gages; valves; industrial instruments; electronic instruments for measurement, transmission and control; aircraft products; hoists, cranes and other materials handling products
(See advertisement on pages 12-13)

Manostat Corporation, 20 N. Moore St., New York, N. Y.

Manross & Sons, F. N., Div., Associated Spring Corp., George St., Bristol, Conn.

Mansfield & Green, 1051 Power Ave., Cleveland 14, Ohio
Pressure testing instruments

Manson Laboratories, 207 Greenwich Ave., Stamford, Conn.
Mass spectrographs; electrical and electronic testing instruments; power supplies

Mantec, Inc., 132 Maryland St., El Segundo, Calif.
High-low temperature, humidity and fungus chambers; shock test machines; hydraulic test benches

Manufacturers Engrg. & Equipment Corp., 10 Mill Road, Hatboro, Penna.
Gas and optical densitometers

Marac Machinery Corp., 1819 Broadway, New York 23, N. Y.

Marathon Battery Co., Wausau, Wis.

Marble-Card Electric Co., Gladstone, Mich.
Fractional-hp motors

Marchant Calculators, Inc., 1475 Powell St., Oakland 8, Calif.
Fully and semi-automatic all-electric desk calculators; electronic computers and data processing systems

Marchant Research Inc., 1475 Powell St., Emeryville, Calif.
Digital computers

Marco Industries Inc., Depew, N. Y.
Instrument and servomechanism motors

Marconi Instrumens Ltd., 44 New St., New York, N. Y.
Electrical and electronic instruments; frequency standards; amplifiers

Marine Compass Co., Pembroke, Mass.
Marine instruments

Marine and Industrial Products Co., 3731-35 Filbert St., Philadelphia 4, Pa.
Relief and pop safety valves

Marion Electrical Instrument Co., Stark St. Gate, Grenier Fld., Manchester, N. H.
Electrical indicating instruments; relays

Maris Co., John M., 2100 Arch St., Philadelphia 2, Pa.
Laboratory apparatus

Marks Polarized Corp., 153-16 10th Ave., Whitestone, L. I., N. Y.
Optical components and materials

Marlin-Rockwell Corp., Jamestown, N. Y.
Ball and roller bearings

Marsco Manufacturing Co., 2909 S. Halsted St., Chicago 8, Ill.
Glass fabrication to close tolerances; tempering of glass for increased resistance to physical, thermal shock; custom drilling, ceramic decoration, shaping
(See advertisement on page 121)

Marsh Corp., Jas. P., 3501 Howard St., Skokie, Ill.
Indicating gages; recording gages; dial thermometers; recording thermometers; refrigeration service instruments; temperature controlling systems; valves for heating systems

Marshall Co., C. & E., 1445 West Jackson Blvd., Chicago 80, Ill.
Manufacturers and distributors of jewelers', watchmakers' and engravers supplies

Marshall Co., L. H., P. O. Box 3657, Beechwood Sta., Columbus 14, Ohio
Laboratory furnaces and foundry thermocouples

Marshall Instruments, Inc., 6859 Tujunga Ave., No. Hollywood, Calif.
Dial and special-type thermometers

Marshalltown Mfg. Co., Marshalltown, Iowa
Pressure gages and indicating thermometers
(See advertisement on page 173)

Martin & Co., H. S., 1916 Greenleaf St., Evanston, Ill.
Laboratory apparatus; glass and quartz components; voltage regulators

Martin-Decker Corp., 3431 Cherry Ave., Long Beach 7, Calif.
Industrial scales; tensiometers

Martindale Electric Co., Box 617, Edgewater Branch Cleveland 7, Ohio
Testing and repair instruments and equipment for electric motors and generators

Marvel Engineering Co., 7227 N. Hamlin Ave., Chicago 95, Ill.
Filters for hydraulic oils; coolants; lubricants; and low pressure circulating systems

Marx Co., Clarence J., P. O. Box 4033, Cleveland 23, Ohio
Speed measuring instruments
(See advertisement on page 209)

Maryland Electronic Mfg. Corp., 5009 Calvert Rd., College Park, Md.

Maryland Etching Co., Eudowood Lane, Towson 4, Md.

Mason Electric Corp., 3839 Verdugo Rd., Los Angeles 65, Calif.
Rotary and toggle switches

Mason Instrument Co., 29 Elm Ave., Mt. Vernon, N. Y.
Optical pyrometers; furnace temperature controls

Mason-Neilan Division, Worthington Corp., 55 Nahatan St., Norwood, Mass.
Industrial control equipment for pressure temperature, flow, liquid level, combustion and ratio; diaphragm control valves; pressure and vacuum regulators; level controllers; pump speed governors; pump pressure regulators; pipe strainers
(See advertisement on page 52)

Mass Instruments, 84-51 Beverly Rd., Kew Gardens 15, L. I., N. Y.
Photoelectric colorimeters, photometers

Massa Laboratories Inc., 5 Fottler Rd., Hingham, Mass.
Acoustic instruments, sound pressure measurement standards

Massachusetts Gear & Tool Co., 12 Nashua St. Woburn, Mass.
Special gears and gear units

Master Electric Co., 126 Davis Ave., Dayton 1, Ohio
Electric motors from ⅛ to 400 hp.; gearmotors; speedrangers

Matisa Equipment Corp., 1020 Washington Ave. Chicago Heights, Ill.
Aircraft instruments; process measurement and control instruments

Matthews Instrument Co., 1350 Burlington Ave., Bristol, Conn.
Odometers

Maurer, Inc., J. A., 37-01 31 St. Long Island City 1, N. Y.
Motion picture cameras

Maveg Machine Sales Association, Chamber of Commerce Bldg., Long Island City, N. Y.
Dilatometers; dual comparators

Maxson Corp., W. L., 460 West 34 St., New York 1, N. Y.
Aircraft instruments; computing machines; integrators; gyro stabilizers; aircraft and naval current controls

Maxson Instrument Div. of W. L. Maxson Corp., 7-37 Austelle Place, Long Island City 1, N. Y.

May Engineering Co., 14549 Victory Blvd., Van Nuys, Calif.
Lumped-constant delay lines; counting and marking machines

Mayer Co., George J., 546 E. Market St., Indianapolis 4, Ind.

Maymer Corp., 1961 W. 112th St., Cleveland 2, Ohio
Scales, dials and name plates
(See advertisement on page 193)

Mayne Products Co., 324 Harries Bldg., Dayton 2, Ohio

McAlear Manufacturing Co., 1901 S. Western Ave., Chicago 8, Ill.
Pressure regulators, diaphragm control valves; float valves; special valves; pipeline strainers

McCoy Electronics Co., Mt. Holly Springs, Pa.
Crystals; crystal ovens

McDanel Refractory Porcelain Co., 510 Ninth Avenue, Beaver Falls, Pa.
Porcelain insulators, components; pyrometers
(See advertisement on page 228)

McDonnell & Miller, Inc., 3500 N. Spaulding Ave., Chicago 18, Ill.
Float-operated switches; float-operated valves; pressure actuated valves

McDonnell Odometers Co., 3501 So. Kedzie Ave., Chicago 32, Ill.
Counters

McFarlin Co., 29 West Marion Ave., Youngstown 2, Ohio
Leak detectors

McGill Mfg. Co., Inc., Valparaiso, Ind.

McKenna Lab., 2503 Main St., Santa Monica, Calif.
Ultrasonic equipment

McKesson & Robbins, Inc., 1706 First Ave., Birmingham 3, Ala.
Laboratory supplies

McNeill Engineering Co., 4057 West Van Buren St., Chicago 24, Ill.
Smoke alarms

McPherson Precision Instruments, Paul M., 527 Main St., Acton, Mass.
Laboratory supply house

McShan Development Corp., 63 Cutter Mill Road, Great Neck, L. I., N. Y.
Audio frequency standards; filters; components

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Air cylinders; valves; impact hammers; timers; work feeders

Measurements Corp., Boonton, N. J.
Radio frequency testing and measuring devices
(See advertisement on page 48)

Mechanical Industries Production Co., 217 Ash St., Akron 3, Ohio
Thermostats

Mechanical Products Corp., 168 N. Ogden Ave., Chicago 7, Ill.
Metering pumps; automatic dispensers

Medical Electronics Development Co., 12 Crampton Lane, Great Neck, L. I., N. Y.
Objective blood pressure measuring instruments; instruments for medicine

Mechaponents Division, Servomechanisms, Inc., 1000 El Segundo Blvd., Hawthorne, Calif.
Miniature and sub-miniature transformers, filters and coils

Mechtronics Co., 423 W. Coulter St., Philadelphia 44, Pa.
Special automated devices; engineering services

Meck Industries, John, Plymouth, Ind.

Mega Research, P. O. Box 371, Dover, N. Y.
Computers; integrators; voltage regulators

Meikle Manufacturing Co., 1335 S. MacArthur Blvd., Springfield, Ill.
Pivots and staffs for meters

Meletron Corp., 950 N. Highland Ave., Los Angeles 38, Calif.
Pressure operated switches

Menlo Research Lab., P. O. Box 522, Menlo Park, Calif.
Nucleonic and ultraviolet instrumentation and components; grain testers

Mepco Inc., 37 Abbett Ave., Morristown, N. J.
Standard and special resistors

Mercoid Corp., 4201 Belmont Ave., Chicago 41, Ill.
General purpose, weather-resistant, explosion-proof, mercury-switch equipped controls for pressure, differential pressure, temperature, liquid level, mechanical movement; transformer relays
(See advertisement on page 213)

Mercon Regulator Co., 2357 N. 29th St., Milwaukee 10, Wis.
Power plant specialties in regulation of pressure, level, rate of flow, proportioning and temperature

Mercury Contacts, Inc., P. O. Box 615, Far Hills Station, Dayton 9, Ohio
Relays and switches

Mercury Electronic Co., Box 450 B, Red Bank, N. J.

Mercury Glass Co., Pleasantville, N. J.
Glass tubing

Meriam Instrument Co., 10920 Madison Ave., Cleveland 2, Ohio
Manometers; accessories; specialized processing of manometric fluids
(See advertisement on pages 113, 143)

Merit Transformer Corp., 4427 N. Clark St., Chicago, Ill.
Transformers, coils and reactors, electrical windings

Merkle Korff Gear Co., 213 North Morgan St,, Chicago 7, Ill.
Motorized speed reducers; induction, synchronous, reversing, dc universal motors

Merkle-Metal Products Co., 1010 W. Lake Street, Chicago 7, Illinois

Merrick Scale Mfg. Co., 180-186 Autumn St., Passaic, N. J.
Automatic continuous weighing machines

Merritt Engrg. & Sales Co., Inc., 120 S. Niagara St., Lockport, N. Y.
Consistency controls

Merry Instrument Co., 138 Allen St., Buffalo 1, N. Y.
Optical components, systems and machines

Merz Engineering Inc., 200 S. Harding St., Indianapolis 7, Ind.
Gages and gaging fixtures

Metal & Alloy Specialties Co., Inc., 1875 Elmwood Ave. Buffalo 7, N. Y.

Metal & Thermit Corp., Rahway, N. J.
Aluminum, brass, copper, steel, stainless steel, Monel, nickel, and Inconel products

Metal Goods Corp., 1800 Page Blvd., St. Louis 14, Mo.

Metal Specialty Co., B & O and Este Ave., Cincinnati, Ohio

Metallab Equipment Co., Div. of Norbute Co., 270 Duffy Ave., Hicksville, L. I., N. Y.
Laboratory furniture

Metalphoto Corp., 2903 E. 79th St., Cleveland 4, Ohio
Photosensitive anodized aluminum plates; dial faces; fluorescent chemicals

Metalsalts Corp., 200 Wagraw Rd., Hawthorne, N. J.
Mercury

Metavac, Inc., 45-68 162 St., Flushing 58, N. Y.
Precision electronic components: wave guide resistance elements; metallized glass attenuator plates; disc and coaxial resistors; optical coatings (reflective, non-reflective)
(See advertisement on page 107)

Meters, Incorporated, 5353 N. Keystone Ave., Indianapolis 20, Ind.
Electrical indicating instruments

Metlab Co., 1000 E. Mermaid Lane, Philadelphia 18, Pa.

Metrogram Corp. of America, P. O. Box 137, Burlington, Vt.
Automatic check weighing machines; over and under indicating scales

Metron Instrument Co., 432 Lincoln St., Denver 9, Colo.
Comparator gages; electric tachometers; timers; chronographs

Metrotype Corp., 104 E. Street, Michigan City, Ind.

Digital recording, digital indicating, and scanning equipment; telemetering and tie line load control equipment

Metzger & Son, F. F., 2600 N. 6th St., Philadelphia 33, Pa.
Extensometers and gages

Meyer-Opticraft, 39 W. 60th, New York 23, N. Y.

Meyer Governor Co., 284 Baker Bldg., Minneapolis 2, Minn.
Long-distance recording, indicating, and contact-making instruments; gage pulsation protectors

Meyer Scientific Supply Co., Inc., 221 Atlantic Ave., Brooklyn 2, N. Y.
Laboratory apparatus

Meyercord Co., 5323 W. Lake St., Chicago 44, Ill.

Mica Insulator Co., 797 Broadway, Schenectady 1, N. Y.

Micamold Electronics Manufacturing Corp., 1087 Flushing Ave., Brooklyn 37, N. Y.

Michigan Electronics, Inc., 854 N. Rockwell St., Chicago 22, Ill.
Tape recorders; components

Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Machines for gear forming

Michigan Wire Cloth Co., 2100 Howard St., Detroit 16, Mich.
Industrial wire cloth; metal filler cloth; fabricated strainers

Mico Instrument Co., 80 Trowbridge St., Cambridge, Mass.
Precision mechanical and electromechanical instruments and devices for laboratory, model shop, prototype department and home workshop
(See advertisement on page 136)

Micro Balancing, Inc., 191 Herricks Road, Garden City Park, L. I. 14, N. Y.

Micro-Circuits Co., New Buffalo, Mich.
Electrically conductive coatings, etch and solder dip resist coatings for shielding and printed circuits

Micro Gee Products, Inc., 6100 W. Slauson Ave., Culver City, Calif.
Simulation tables; signal simulators

Micro Master Co., 2733 N. Pulaski Rd., Chicago 39, Ill.
Dial indicators and taper gages

Micro Metallic Corp., 30 Sea Cliff Ave., Glen Cove, N. Y.
Pressure snubbers; filters

Micro Metric Instrument Co., 21509 McCracken Rd., Box 884, Cleveland 22, Ohio
Chemical and biological instruments

Micro-Poise Engrg. & Sales Co., 14851 Grand River Ave., Detroit 27, Mich.
Balancing machines

Micro Switch Div., Minneapolis-Honeywell Regulator Co., Spring Street, Freeport, Illinois
Snap action switches; mercury switches

Microchemical Service, 44-27 Douglaston Pkway., Douglaston, N. Y.
Microchemical laboratory apparatus

Microchemical Specialties Co., 1834 University Ave., Berkeley 3, Calif.
Laboratory apparatus; components

Microdot, Inc., 1826 Fremont Ave., South Pasadena, Calif.
Miniature coaxial cables, connectors, and assemblies; teflon cables

Microloc Corp., 5300 104th St., Los Angeles 45, Calif.
Aircraft instruments

Micromax Co., 1964 Utica Ave., Brooklyn 34, N. Y.
Voltage-dividing resistors

Micrometrical Manufacturing Co., 345 S. Main St., Ann Arbor, Mich.
Surface finish gages; bearing testers

Micron Gear Manufacturing Co., 102-38 Corona Ave., Corona, L. I., N. Y.
Instrument gears

Microphase Corp., P. O. Box 1116, Greenwich, Conn.
R-f filters

Microtech Corp., 200 W. Colorado St., Pasadena 1, Calif.
Precision ground, instrument and miniature ball bearings

Microtech Services Co., Box 121, Berkeley, Calif.
Ultramicro balances

Microtran Company, Division of Crest Laboratories, Inc., 145 E. Mineola Ave., Valley Stream, L. I., N. Y.
Miniaturized transformers and reactors

Microwave Assocs., Inc., 22 Cummington St., Boston 15, Mass.
Microwave instruments

Mid-Century Instrumatic Corp., 611 Broadway, New York 12, N. Y.
Electronic computers; multipliers; recording oscillographs
(See advertisement on page 42)

Mid-West Dynamometer & Engrg. Co., 3100 River Road, River Grove, Ill.
Dynamometers

Midwestern Instruments, 3401 So. Harvard, Tulsa, Okla.
Geophysical instruments; amplifiers; galvanometers

Mikron Instruments, Inc., 1966 E. Walnut St., Pasadena, Calif.
Surveying instruments; optical instruments; prisms; mirrors; lenses

Mil Instrument Corp., 92-15 172nd St., Jamaica, L. I., N. Y.
Electrical indicating instruments; galvanometers

Millen Mfg. Co., James, 150 Exchange St., Malden 48, Mass.
Radio test instruments; special electronic components

Miller Dial and Name Plate Co., 4400 N. Temple City Blvd., El Monte, Calif.
Etched, lithographed, and silk screened nameplates and panels; edge-lighted panels

Miller-Harris Instrument Co., 601 E. Ogden Ave., Milwaukee 2, Wis.
Automatic time controllers

Miller Instruments Inc., Wm., 325 N. Halstead Ave., Pasadena 8, Calif.
Recording oscillographs; cathode ray recorders; amplifiers; instrument transformers

Miller, M. C., Box 721, Allendale, N. J.
Electrical instruments

Miller Labs., August E., 9226 Hudson Blvd., N. Bergen, N. J.

Miller-Robinson Co., 7007 Avalon Blvd., Los Angeles, Calif.
Pressure switches for specialized applications involving unusual conditions of G-loading or vibration; special Bourdon tube design and fabrication

Miller & Sons, R. F., Harvard, Nebr.
Fault-locating instruments

Millers Falls Co., 57 Wells St., Greenfield, Mass.
Machine shop gages; power tools

Millivac Instruments Corp., 444 Second St., P. O. Box 997, Schenectady 6, N. Y.
Special electronic instruments

Milo Radio & Electronics Corp., 200 Greenwich St., New York 7, N. Y.
Electronic equipment distributor

Milsco Mfg. Co., 2758 N. 33 St., Milwaukee 10, Wisc.

Milwaukee Gas Specialty Co., 730 N. Jackson St., Milwaukee 1, Wis.
Sensitive, hermetically sealed relays
(See advertisement on page 186)

MinAtron Corp., 3 Cliveden Place, Belle Meade, N. J.
Differential transformers; impulse generators; instrumentation systems

Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.
Instruments for air pollution, gas analysis, humidity, sound
(See advertisement on page 20)

Mine & Smelter Supply Co., 1422-17th St., Denver, Colo.
Industrial equipment and supplies

Miniature Precision Bearings, Inc., Precision Park, Keene, N. H.
Instrument pivots and bearings

Minitec, 5423 Delaware Ave., Los Angeles 41, Calif.
Thermal switches

Minneapolis Elect. & Construction Co., 80 South 12th St., Minneapolis 4, Minn.
Wire length measuring machines

Minneapolis-Honeywell Reg. Co., Indus. Div., Wayne & Windrim Aves., Philadelphia 44, Pa.
Thermocouple and optical pyrometers; resistance thermometers; pressure thermometers; pressure gages; flow meters; liquid level gages; hygrometers; CO_2 meters; control systems (electric, air-operated, and combined electric and air-operated); combustion safety controls; moisture content recorders and controllers; furnace atmosphere recorders

Minnesota Electronics Corp., (See Librascope, Burbank Div.)

Minnesota Mining & Manufacturing Co., 900 Fauquier Ave., St. Paul 6, Minn.
Magnetic recording tape; cable insulations; electrical connectors; coated abrasives

Mira Scientific Instruments, 2656 N. Pasadena Ave., Los Angeles 31, Calif.
Gas analyzers; electrical and electronic instrumentation; components

Mitchell Camera Corp., 666 W. Harvard St., Glendale 4, Calif.
Scientific motion picture cameras; components

Mitchell Industries, Inc., P. O. Box 17, Mineral Wells, Texas

Mitchell Radiation Prods. Corp., P. O. Box 70, Norristown, Pa.
X-ray apparatus

Mitchell Rand Insulating Co., 51 Murray St., New York 7, N. Y.

Mitchell Scientific, 93 Mac Queston Pwky. No., Mt. Vernon, N. Y.
Collimators

Mixing Equipment Co., Inc., 135 Mt. Read Blvd., Rochester 11, N. Y.
Laboratory apparatus

Model Engineering & Mfg. Co., 2800 N. Milwaukee Ave., Chicago 18, Ill
Resistors

Model Rectifier Corp., 1065 Utica, Brooklyn 25, N. Y.

Modern Electrical Laboratory, 6131 S. Wentworth Ave., Chicago 21, Ill.
Laboratory apparatus

Modern Laboratory Equipment, Co. Inc., 1809-11 First Ave., New York 28, N. Y.
Ovens; oil and water baths; viscosity baths; chromatography traction collector; precision temperature equipment

Modern Metalcraft, 1075 N. Eastman Rd., Midland, Mich.
Metering and proportioning pumps; dual syringe feeders

Modernair Corp., 400 Preda St., San Leandro, Calif.
Cylinders and valves for air, water or oil hydraulic service; special fluid power components and packaged devices for automation

Modev Co., 1825 Ravenwood Ave., Dayton, Ohio

Moeller Instrument Co., 132nd St. & 89th Ave., Richmond Hill, N. Y.
Industrial and laboratory dial thermometers and recorders (liquid-in-glass, bi-metallic, filled systems); hydrometers; salinometers; ship clinometers; vacuum gages; thermowells
(See advertisement on page 36)

Mohawk Electronic Research Labs., R. D. 4, Amsterdam, N. Y.
Electrical and electronic instrumentation

Moisture Register Co., 1510 W. Chestnut St., Alhambra, Calif.
Moisture testing instruments and devices

Molded Insulation Co., 335 E. Price St., Philadelphia 44, Pa.
Moline Furniture Works, Moline, Ill.

Laboratory furniture

Monarch Manufacturing Co., 2014 N. Major Ave., Chicago 39, Ill.
Radio set testers

Monitor Controller Div., Industrial Electronics Co., Inc., 99 Grove St., Rockland, Mass.
Automatic electric motor controls

Monroe Calculating Machine Co., Inc., Electronics Div., E. Hanover Ave., Morris Plains, N. J.
Digital computers; plug-in circuitry

Monsanto Chemical Co., 1700 S. Second St., St. Louis 4, Mo.

Monsell, J. R., Pitman, N. J.
Dynamometers

Montgomery Mfg. Co., 202-204 Main St., Owensville, Ind.
Program clocks

Moog Valve Co., Inc., Proner Airport, E. Aurora, N. Y.
Servo valves

Moore & Co., Samuel, Mantua, Ohio
Polyethylene or vinal plastic coatings for instrument tubing
(See advertisement on page 40)

Moore Company, H. R., 200 W. Montgomery Ave., Hatboro, Pa.
Paint and film testing instruments; viscometers

Moore Corporation, John B., Peerless Bldg., P. O. Box 3, Nutley 10, N. J.
Instrument cleaning compounds and associated equipment

Moore Products Co., 901 E. Lycoming St., Philadelphia 24, Pa.
Industrial instruments

Moraine Products Div., General Motors Corp., 1420 Wisconsin Blvd., Dayton 1, Ohio
Sintered metal powder filters; flame arrestors; bearings and structural parts; bi-metal bushings and washers

Moran Instrument Corp., 170 E. Orange Grove Ave., Pasadena 3, Calif.
Airborne and car mounted scintillation counters; portable electronic surveying systems

Morehouse Machine Co., 233 W. Market St., York, Pa.
Force measuring calibration equipment
(See advertisement on page 215)

Morganite, Inc., 3302-3320 48th Ave., Long Island City 1, N. Y.
Pyrometer tubes

Morrill & Morrill, 30 Church St., New York 7, N. Y.

Morris Co., J. I., 384 Elm St., Southbridge, Mass.

Moseley Co., F. L., 409 Fair Oaks Ave., Pasadena 3, Calif.
Two-axis ("X-Y") recorders; control drives
(See advertisement on page 247)

Moser Jewel Co., P. O. Box 150, Perth Amboy, N. J.
Jewel bearings for electrical, aircraft, mechanical and marine instruments; steel and osmium tipped pivots
(See advertisement on page 130)

Moss & Co., Henry, 113-53rd St., Brooklyn 3, N. Y.

Mossman, Inc., Donald P., P. O. Box 265, Brewster, N. Y.
Lever, push button and turn switches

Motordyne Inc., 2661 S. Myrtle Ave., Monrovia, Calif.
Fractional-hp, ac and dc motors

Motson Co., J. Frank, 1717 Bethlehem Pike, Flourtown, Pa.
Printing on plastics, glass, metals, ceramics, etc., printed circuits

Mt. Sopris Instrument, 1320 Pearl St., Boulder, Colo.
Geophysical and nucleonic instruments

Mountain Systems Inc., 864 Franklin Ave., Thornwood, N. J.
Digital computers; data handling systems; and processing equipment

Mucon Corporation, 9 St., Francis St., Newark 5, N. J.

Mueller Electric Co., 1583 E. 31st St., Cleveland 14, Ohio
Electrical test clips; alligator clips; insulators; C ground clips
(See advertisement on page 83)

Mueller Laboratory, 1052 N. Allen Ave., Pasadena, Calif.
Dimensional gages; magnetic counters; laboratory supply house

Mullen Tester Div., see Perkins and Son, Inc., B. F.
Mullenbach Div., Electric Machinery Manufacturing Co., 2100 E. 27th St., Los Angeles 58, Calif.
Electro-strictive relays and actuators; packaged instrumentation panels and controls; power resistors packaged motor control systems

Multi-Amp Corp., 465 Lehigh Ave., Union, N. J.
Portable and bench-type high current test equipment

Municipal Instrument Co., 3246 S. Cuyler Ave., Berwyn, Ill.
Magnetic dipping needles; pipe phone for checking leaks

Munsell Color Co., Inc., 10 E. Franklin St., Baltimore 2, Md.
Color comparators; color standards

Murphy & Miller, Inc., 1326 So. Michigan Ave., Chicago 5, Ill.
Environmental test equipment to simulate low temperature, high temperature, humidity, altitude, air dryers; temperature baths
(See advertisement on page 105)

Mu-Switch Division of Aero Mfg. Co., 2040 E. Main St., Columbus, Ohio
Temperature and combustion controllers; snap switches

Mutual Industries, 1027 N. Seward St., Los Angeles, Calif.

Mycalex Corp. of America, Clifton Blvd., Clifton, N. J.
Tube sockets; insulating materials

Myer Corp., Acra-Ment Gage Div., 633 Park Ave., Cranston, R. I.
Dimensional gages and fixtures

N

NJE Corp., 345 Carnegie Ave., Kenilworth, N. J.
Electrical and electronic instrumentation; power supplies; transformers; filterchokes; components

NRD Instrument Co., 6425 Etzel Ave., St. Louis 14, Mo.
Radiation detecting and counting instruments

NYT Electronics, Inc., 2979 N. Ontario St., Burbank, Calif.

Nader Manufacturing Co., 2661 S. Myrtle Ave., Monrovia, Calif.
Transistorized dc transformers; centrifugal governors for fractional-hp motors; miniature motor overload switches

Nalley Co., Leonard L., 833 W. Plum St., Compton 4, Calif.
Electric analog computers; complex-wave generators; fire-control instruments; amplifiers; power supplies

Nankervis Co., G. L., 15310 Fullerton Ave., Detroit 27, Mich.
Special testing equipment and systems for the automotive and aircraft industries

Narda Corp., 160 Herricks Rd., Mineola, L. I., N. Y.
Microwave and high-frequency equipment; thermistors

Nash Engineering Co., 370 Wilson Road, South Norwalk, Conn.
Instrument air compressors
(See advertisement on page 60)

Nashville Surgical Supply Co., 401 Church St., Nashville 3, Tenn.

National Aircraft Corp., 3411 Tulare Ave., Burbank, Calif.
Electronic systems, components; semi-conductor devices; aircraft accessories; aircraft modification

National Appliance Co., 7634 S. W. Capitol Hwy., Portland 19, Ore.
Constant temperature baths, gravity and mechanical convection ovens; laboratory apparatus

National Automatic Products Co., Washington Ave., Berlin, Conn.

National Brass Co., 1600 Madison St., S. E., Grand Rapids 2, Mich.
Combustion and draft controllers

National Carbon Co., A Division of Union Carbide and Carbon Corp., 30 E. 42 St., New York 17, N. Y.
Dry batteries

National Cash Register Co., Main & K Sts., Dayton 9, Ohio
Computers; business machine supplies

National Co., Inc., 61 Sherman St., Malden, Mass.
Capacitors and radio instruments

National Controls, Inc., 400 Homer St., Newton Center, Mass.
Valves; humidity controllers; thermostats

National Cylinder Gas Co., 840 N. Michigan Ave., Chicago 11, Ill.

National Decalcomania Corp., 236 N. 60 St., Philadelphia 39, Pa.

National Electric Controller Co., 7070 Glenwood Ave., Chicago 26, Ill.
Rheostats

National Electric Instrument Co., Inc., 92-21 Corona Ave., Elmhurst 73, N. Y.
Bore inspection equipment; telescopes

National Engineering Products, Inc., Washington Bldg., Washington 5, D. C.
Pressure gage equalizers

National Forge & Ordnance Co., Testing Machine Div., Irvine, Warren County, Pa.
Testing machines for materials and finished products

National Instrument Co., 246 Walnut St., Newtonville 60, Mass.
Electromechanical instruments and devices

National Instrument Co., 5005 Queensbury Ave., Baltimore 15, Md.
Automatic pipettes

National Instrument Labs., Inc., 6108 Rhode Is. Ave., Riverdale, Md.
Pneumatic, electronic, and biomedical equipment

National Mailing Bag Co., 291 Hendrix St., Brooklyn 7, N. Y.

National Pneumatic Co., Inc., Industrial Div., 125 Amory St., Boston, Mass.
Fractional-hp, miniature and servo motors

National Pneumatic Co., Inc., Holtzer-Cabot Div., 920 Lexington Ave., New York 17, N. Y.

National Radiac, Inc., 479 Washington St., Newark 2, N. J.

National Research Corp., 70 Memorial Drive, Cambridge 42, Mass.
Optical products, high vacuum apparatus

National Scientific Co., 2204 W. North Ave., Chicago 47, Ill.
Laboratory supply house

National Spectrographic Sales Corp. 6300 Euclid Ave., Cleveland 3, Ohio
Spectrographs; spectroscopes; microdensitometers; testing devices

National Tel-Tronics Corp., 33 St. Casimir Ave., Yonkers, N. Y.
Dial lights; connectors, plugs, clips, etc.

National Time & Signal Corp., 21800 Wyoming Ave., Detroit 37, Mich.
Timers for welding and industrial process control

National Tool Co., 11200 Madison Ave., Cleveland, Ohio
Pocket optical comparators

National Vulcanized Fibre Co., P.O. Box 311, Wilmington 99, Delaware

Natural Gas Equipment, Inc., 804 S. Fair Oaks Ave., P. O. Box 2297-D, Pasadena 2, Calif.
Automatic-control systems, pneumatically actuated valves, control panels

Naxon Utilities Corp., 3600 W. Touhy Ave., Chicago 45, Ill.
Instrument cleaning machines

Negus, T. S. & J. D., 69 Pearl St., New York 4, N. Y.
Nautical instruments

Neider Fused Quartz Co., 90 Broad St., Babson Park Boston 57, Mass.
Optical flats; quartz apparatus and components

Neise, Karl A., 404 Fourth Ave., New York 16, N. Y.
Dimensional gaging equipment

Neison Instrument Co., 607 Howard St., Evanston, Ill.
Custom designers and consultants for control equipment, systems, and installations

Nelson Electric Mfg. Co., P. O .Box 5385, Tulsa 16, Okla.

Nelson Section Liner Co., 229 W. Gardner St., DeKalb, Ill.
Drawing instruments

Nelson & Street, 11705 Highview Ave., Kensington, Md.
Chronographs; timers

Nems-Clarke, Inc., 919 Jesup Blair Dr., Silver Spring, Md.

Neon Claude, Inc., 25 W. 43rd St., New York, N. Y.
Transformers and electrical apparatus

Neptune Meter Co., 19 W. 50th St., New York 20, N. Y.
Liquid meters; gas meters

Neptune Pump Mfg. Co., 4912 N. 6 St., Philadelphia 20, Pa.
Metering and proportioning pumps; chemical feeders

Nesor Alloy Products Co., 282 Halsey St., Newark 2, N. J.
Whisker wire for transistors, diodes

Nester Company, Inc., L. G., Millville, N. J.
Laboratory apparatus; industrial glassware to customer's specifications
(See advertisement on page 120)

Nester Engineering Co., 24 Chestnut St., Rutherford, N. J.

Neucor, Inc., 45 W. Union St., Pasadena 1, Calif.

Neutronic Associates, 87-16 116th St., Richmond Hills 18, N. Y.
Power supplies
(See advertisement on page 166)

New Brunswick Scientific Co., Somerset St., New Brunswick, N. J.
Rotary and reciprocating shakers; laboratory equipment and instruments

New Departure Div., General Motors Corp., Bristol, Conn.
Ball bearings

New England Box Co., Greenfield, Mass.

New England Laminates Co., Inc., 481 Canal St., Box 43, Stamford, Conn.
Metal-clad and unclad plastics laminates
(See advertisement on page 127)

New England Steam Gauge Co., Flanders Rd., Niantic, Conn.

New Hampshire Ball Bearings, Inc., 20 Grove St., Peterborough, N. H.
Miniature ball bearings

New Haven Clock Co., 133 Hamilton St., New Haven 4, Conn.
Capacitors; clock timers

New Hermes Engraving Machine Corp., 13-19 University Place, New York 3, N. Y.
Engraving machines
(See advertisement on page 136)

N. J. Laboratory Supply Co., 235 Plane St., Newark, N. J.
Laboratory supplies

New Jersey Jeweler's Supply House, 280 Plane St., Newark 2, N. J.

New Jersey Meter Co., Plainfield, N. J.
Compressed air meters; separators for removing water and oil from compressed air lines; liquid flow indicators with low flow signaling circuit

New Jersey Zinc Co., 160 Front St., New York 7, N. Y.

New London Instrument Co., Inc., 82 Union St., New London, Conn.
Electronic instruments; high-frequency instruments; signal generators

N. Y. Laboratory Supply Co., Inc., 76 Varick St., New York 13, N. Y.
Laboratory supplies

New York Rubber Corp., 100 Park Ave., New York 17, N. Y.

New York Scientific Supply Co., 28 West 30 West, New York, N. Y.
Laboratory supplies

New York Transformer Co., Alpha, N. J.
Transformers

Newage International, Inc., 222 York Rd., Jenkintown, Pa.
Hardness testers
(See advertisement on page 124)

Newall Mfg. Co., 139 N. Wabash Ave., Chicago 2, Ill.
Precision tools; jewel bearings

Newark Electric Co., 223 W. Madison St., Chicago 6, Ill.
Electrical and electronic instruments and supplies

Newark Scale Works, 10-12 Hobson St., Newark 8, N. J.
Scales

Newark Wire Cloth Co., 336 Verona Ave., Newark, N. J.
Testing sieves

Newmatic Corp., West Hartford, Conn.
Pressure and flow measurement and control instrumentation; timers; switches; laboratory presses

Newton Co., 55 Elm St., Manchester, Conn.
Control and data processing systems and components

Ney Co., J. M., Maplewood Ave., Bloomfield, Conn.

Niagara Blower Co., 405 Lexington Ave., New York, N. Y.
Air Engineering Equipment
(See advertisement on page 61)

Niagara Electrical Instrument Co., 45 Allen St., Buffalo, N. Y.
Electrical power analyzer

Nichols, Lyman, Cherryhurst, Fort Collins, Colorado
Engraving and etching of metal and glass

Nicholson & Co., W. H., 169 Oregon St., Wilkes-Barre, Pa.
Valves and traps

Nilsson Gage Co., Inc., P. O. Box 505, Poughkeepsie, N. Y.
Dimensional gages

Non-Linear Systems, Del Mar Airport, Del Mar, Calif.
Electronic and electrical instruments; digital voltmeters

Norcross Corporation, 247 Newtonville Ave., Newton 58, Mass.
Electric and electric-pneumatic viscometers

Norden-Ketay Corp., 99 Park Ave., New York, N. Y.
Pressure and vacuum instrumentation; aircraft instrumentation; military instruments; electrical and electronic components

Norgren Co., C. A. 3400 S. Elati St., Englewood, Colo.
Lubrication equipment

Norma-Hoffman Bearings Corp., Hamilton Ave., Stamford, Conn.

North American Instruments, Inc., 2420 N. Lake Ave., Altadena, Calif.
Remote-metering equipment; motion recorders; rain gages; fire control and flight test equipments

North American Philips Co., Inc., 100 East 42nd St., New York 17, N. Y.
X-ray diffraction and spectrographic equipment; industrial radiographic and fluoroscopic equipment; liquid air installation

North Electric Mfg. Co., 553 S. Market St., Galion, Ohio
Remote and supervisory equipment; electronic components

North Hills Electric Co., Inc., 203-18 35th Ave., Bayside 61, N. Y.
Coils; coil forms; video amplifiers; regulated power supplies

North Shore Nameplate Inc., 214-27 Northern Blvd., Bayside 61, N. Y.
Anodized and etched aluminum foil nameplates

Northeast Scientific Corp., 617 Concord Ave., Cambridge, Mass.
Microwave instrumentation; high voltage supplies

Norwood Controls, 934 Washington St., Norwood, Mass.
Electromagnetic system for indicating, recording and/or controlling process variables; high-speed rotary switches; pressure pickups.
(See advertisement on page 21)

Norton Electrical Instrument Co., 83 Hilliard St., Manchester, Conn.
Electrical instruments; shunts

Nosker Engineering Products, 1216 Livermore St., Yellow Springs, Ohio
Strain measuring equipment

Nuclear-Chicago (Nuclear Instr. and Chem. Corp.) 223 W. Erie St , Chicago 10, Ill.
Radioactivity measuring and detecting instruments

Nuclear Development Corp. of America, 5 New St., White Plains, N. Y.

Nuclear Development Laboratory, P. O. Box 7034, Kansas City, Mo.
Radium detectors

Nuclear Measurements Corp., 2460 N. Arlington Ave., Indianapolis 18, Ind.
Counting systems; scaling units; air and water monitors; portable instruments

Nuclear Research Corp., Southampton, Pa.
Radioactivity instrumentation; process measurement and control equipment

Nuclear Science & Engineering Corp., P. O. Box 10901, Pittsburgh 36, Pa.
Radioactivity instruments; level indicators

Nucleonic Co. of America, 196 Degraw St., Brooklyn, N. Y.
Radiation detectors

Nurnberg Thermometer Co., Inc., 124 Livingston St., Brooklyn 2, N. Y.
Thermometers and hydrometers—laboratory supply house
(See advertisement on page 219)

Nye, Inc., Wm. F., Box 927, New Bedford, Mass.
Instrument and watch oils

O

OPW Corp., 2735 Colerain Ave., Cincinnati 25, Ohio

Oak Mfg. Co., 1250 Clybourn Ave., Chicago 10, Ill.
Radio and television parts

Offner Electronics, Inc., 5320 N. Kedzie Ave., Chicago 25, Ill.
Oscillographs

O'Hara Waltham Mfg. Co., 74 Rumford Ave., Waltham 54, Mass.

Ohaus Scale Corp., 1050 Commerce Ave., Union, N. J.
Analytical balances

Ohio Carbon Co., 12508 Berea Rd., Cleveland 11, Ohio
Carbon seals; bearings; motor and generator brushes; contacts; carbon and wirewound resistors

Ohio Electric Mfg. Co., 5400 Dunham Rd., Maple Heights, Ohio

Ohmart Corp., 2236 Bogen St., Cincinnati 14, Ohio
Radioactivity gages to measure and control density, specific gravity, percent solids, level of liquids, solids and slurries
(See advertisement on page 180)

Ohmite Mfg. Co., 3601 Howard St., Skokie, Ill.
Close control rheostats, fixed and adjustable power resistors; precision and non-inductive resistors; attenuators; tap switches and r-f chokes; power relays

Oil Well Water Locating Co., 2230 Lemon Ave., Long Beach 6, Calif.
Oil well and refinery electronic integration of water cut in oil; automatic tank control; bleeder control; oil field automation; electronic oil gaging control
(See advertisement on page 152)

Okonite Co., Passaic, N. J.
Air and hydraulic tubing; friction and rubber tapes; electric wires, cords and cables

Oliver Instrument Co., Adrian, Mich.

Oliver Mfg. Co., W. W., 1483 Niagara St., Buffalo 13, N. Y.

Olsen Testing Machine Co., Tinius, Easton Road, Willow Grove, Pa.
Testing machines

Oltronix Co., 235 Underwood Drive, Atlanta 5, Ga.
Standard or specialty electronic instruments for labs, industry and wind tunnels; resale of special power transformers

Olympic Metal Products Co., Inc., P. O. Box 71, Phillipsburg, N. J.
Instrument housings

Omega Machine Co., 345 Harris St., Providence, R. I.
Chemical feeding equipment for dry or liquid materials; by volume or by weight

Omicron Co., 517 State St., Glendale ,Calif.
Beam and bow compasses; ellipsographs

O'Neill-Irwin Manufacturing Co., 554 8th Ave., Lake City, Minn.

Opad Electric Co., 69 Murray St., New York 7, N. Y.
Power supplies; electrical and electronic test instruments; components
(See advertisement on page 166)

Opplem Co., Inc., 83 Uhland St., E. Rutherford, N. J.
Optical instruments and components; electrical and mechanical testing and measuring instruments

Optical Coating Lab., Inc., 1035 Sebastopol Rd., Santa Rosa, Calif.
Low-reflecting surface glass; lenses; mirrors

Optical Development Corp., 949 Broadway, New York 10, N. Y.
Magnifiers; microscope accessories

Optical Film Engineering Co., 2731 N. Sixth St., Philadelphia 33, Pa.
Vacuum pumps; optical parts

Optical Gaging Products, Inc., 26 Forbes St., Rochester 11, N. Y.
Dimensional gaging and inspection equipment

Optionic Research, Inc., 1374 Massachusetts Ave., Cambridge 38, Mass.
Biological instruments

Optron Corp., 3526 State St., Santa Barbara, Calif.
Displacement followers

Optron Laboratory, 2736 Salem Ave., Dayton 6, Ohio
Optical flats; reflectors; prisms

Orban Co., Inc., Kurt, 34 Exchange Place, Jersey City 2, N. J.
Machine tools; mechanical recording indicators; precision gear checking equipment

Oregon Electronics, 2232 E. Burnside Ave., Portland 15, Oregon
Regulated power supplies

Ornyx Company, 9015 Wilshire Blvd., Beverly Hills, Calif.
Soldering irons

Orton Ceramic Foundation, Edward, Jr., 1445 Summit St., Columbus 1, Ohio
Pyrometric cones

Osborne Electric Co., 712 S. E. Hawthorne Blvd., Portland, Oregon
Electrical components

Osby & Barton Co., Division of Flightex Fabrics, Inc., 148 W. River St., Providence 4, R. I.
Electronic instruments; precision component parts; precision tools

Oster Mfg. Co., John, Avionic Div., 1 Main St., Racine, Wisc.
Fractional-hp motors; actuators; d.c. motors; motor gear trains; servo torque units; tachometer generators

Owen Laboratories, 55 Beacon Place, Pasadena 10, Calif.
Transistor test equipment; highly-regulated low-voltage dc power supplies for strain gage and related applications; custom instrumentation
(See advertisement on pages 72, 226)

Owens-Illinois Glass Co., Owens-Illinois Bldg., Toledo 1, Ohio
Scientific and industrial instruments; and glass components

P

PCA Electronics Inc., 2180 Colorado Ave., Santa Monica, Calif.
Transformers, pulse; delay lines; networks, pulse forming; circuits, potted, including embedded components
(See advertisement on page 225)

P-K Valve Corp., 683 Third Ave., New York 17, N. Y.
Venturi-ball type valves

PSP Engineering Co., 8608 Otis St., South Gate, Calif.
Direct current solenoids for use in computers, gyros, and other avionic components

P-W Industries, Inc., Duncan & Melrose Sts., Philadelphia 24, Pa.
Cable and tubing supports
(See advertisement on page 230)

Pace Electrical Instruments Co., Inc., 70-31 84th St., Glendale 27, L. I., N. Y.
Electrical indicating instruments

Pace Engineering Co., 6914 Beck Ave., North Hollywood, Calif.
Electromechanical transducers for the measurement of pressure, acceleration and other variables, together with associated equipment for recording and control

Pacific Industrial Electronics, 252 Fifth St., San Francisco 3, Calif.
Printed circuits; special power supplies; medical instrumentation; diode test sets; microphonic manometers

Pacific Instrument Co., 3226 Randolph Ave., Oakland 2, Calif.
Electrical and electronic test instruments; components

Pacific Laboratories, 12808 Venice Blvd., Los Angeles 66, Calif.
Data recording cameras; interval timers

Pacific Optical Corp., 5965 W. 98th St., Los Angeles 45, Calif.
Optical instruments for industrial, scientific, educational and military use; optical fabrication in glass and plastic lenses
(See advertisement on page 154)

Pacific Scientific Co., Inc., P. O. Box 22019, Los Angeles, Calif.
Accelerometers; gyroscopes; potentiometers; industrial heat treating furnaces

Pacific Semiconductors, Inc., 10451 W. Jefferson Blvd., Culver City, Calif.
Transistors; diodes; power rectifiers

Pacific Transducer Corp., 11838 W. Pico Blvd., Los Angeles 64, Calif.
Microscopes and accessories; electrical instruments and components; ultra-violet lamps; surface temperature, recording, stem, glass and mercury thermometers; hardness testers

Pacific Universal Products Co., 168 Vista Ave., Pasadena 8, Calif.
High vacuum coating of lenses; prisms, optical and military systems; first surface and transparent mirrors; plastic metallizing; filters and other glass components
(See advertisement on page 147)

Packard Instrument Co., Box 428, La Grange, Ill.

Packless Metal Hose, Inc., 31 Winthrop Ave., New Rochelle, N. Y.

Pak-Rapid, Inc., Elizabeth St., West Conshohocken, Pa.
Automatic packaging machines

Palm Bros. Decalcomania Co., 3684 Regent Ave., Cincinnati 12, Ohio
Decalcomanias

Palmer Thermometers, Inc., 2501 Norwood Ave., Cincinnati 12, Ohio
Industrial indicating thermometers; mercury actuated dial and recording thermometers; laboratory and ASTM precision types
(See advertisement on page 38)

Palnut Company, 61 Cordier St., Irvington 11, N. J.
Locknuts, fasteners, and associated tools; hardware

Palo Laboratory Supplies, Inc., 81 Reade St., New York 7, N. Y.
Paper testing machines; laboratory supplies

Palo-Myers Inc., See Palo Lab. Supplies, Inc.

Palos Optical Co., Palos Heights, Ill.
Optical instruments

Pan-Technics, Ltd., P. O. Box 578, Encinitas, Calif.
Front surface mirrors

Panalarm Products, Inc., 6312 N. Broadway, Chicago 40, Ill.
Annunciator and alarm systems; liquid level indicators and recorders; relays

Panascan, Inc., 6312 N. Broadway, Chicago 40, Ill.
Process scanning and monitoring systems

Pancro Mirrors Inc., 2958 Los Feliz Blvd., Los Angeles 39, Calif.
Mirrors, high vacuum coatings
(See advertisement on page 147)

Panellit, Inc., 7401 N. Hamlin Ave., Skokie, Ill.
Instrument panels, pressure indicators
(See advertisement on page 88)

Panoramic Radio Products, Inc., 10 S. Second Ave., Mt. Vernon, N. Y.
Electronic instruments and inspection devices

Paper Manufacturers Co., Inc., 5th & Willow St., Philadelphia 23, Pa.

Par-Metal Products Corp., 32-62 49th St., Long Island City 3, N. Y.
Instrument racks; panels; utility desk assemblies

Para Laboratory Supply Co., 221 N. Hermitage Ave., Trenton 8, N. J.
Laboratory supply house

Paragon Electric Co., 1600 12th St., Two Rivers, Wis.
Timers

Paramount Paper Tube Corp., 614 Lafayette St., Fort Wayne 2, Ind.
Spiral wound paper tubing

Parisian Novelty Co.. 3510 S. Western Ave., Chicago 9, Ill.

Park Nameplate Co., Inc., 34-10 Linden Pl., Flushing 54, L. I., N. Y.
Anodized, pressure sensitive aluminum nameplates; instruction plates; decorative trim

Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio
Tube and hose fittings; tube fabricating equipment; hydraulic control, and check valves; accumulators; synthetic O-rings; tread sealing compound
(See advertisement on pages 18-19)

Parks-Cramer Co., Fitchburg, Mass.
Jacketed valves, fittings and piping, air and hydraulic valves

Parr Instrument Co., 211-53 St., Moline, Ill.
Combustion bombs; calorimeters; hydrogenation apparatus; melting point apparatus

Parr Manufacturing Corp., 48 Hale St., Cranford, N. J.
Electrical ground detectors; fault locators

Parsons Co., Ralph M., Electronics Div., 135 W. Dayton St., Pasadena, California
Specialized electronic, electromechanical and mechanical information equipment

Partlow Corp., 2 Campion Rd., New Hartford, N. Y.
Temperature indicators and controllers, thermometers process timers

Pasadena Hydraulics, Inc., 279 N. Hill Ave., Pasadena 4, Calif.
Hydraulic presses with individually controlled heated platens up to 600°F., bench and floor models from 20 to 125 tons

Passaic Analytical Laboratories, Inc., Passaic Ave., Caldwell, N. J.
Instrument cleaning machines

Patent Button Co., Patwin Instruments Div., Waterbury 20, Conn.
Chemical analyzers; polarographic analyzers; flame photometers; indicating potentiometers

Patterson Co., Wayne D., 807 Yale St., Los Angeles 12, Calif.

Patterson Screen Div., E. I. duPont de Nemours & Co., Towanda, Pa.
X-ray intensifying and fluoroscopic screens

Patton-MacGuyer Co., 17 Virginia Ave., Providence 5, R. I.

Patwin Instruments Div., see Patent Button Co.

Paul & Stein Bros., Inc., F. H., 235 Fifth Ave., New York 16, N. Y.
Electrical and electronic components

Paulstick & Sons, H., 2124 Fulton St., Brooklyn 33, N. Y.
Thermometers

Pederson Electronics, 3667 Mt. Diabolo Blvd., Lafayette, Calif.
High-fidelity equipment: Am-fm tuners, 20 and 50 watt amplifiers and pre-amp-amplifier combinations

Peer, Inc., 1200-48 Milton St., Benton Harbor, Mich.

Peerless Electric Co., 1401 W. Market St., Warren, Ohio
Thermocouple restorers; fractional-hp. motors

Peerless Equipment Co., 111 Ortega Ave., Mountain View, Calif.
Electrical and mechanical counting, timing and recording devices and actuating switches

Peerless Roll & Leaf Co., Inc., Precision Rolled Metal Div., 1511 New York Ave., Union City, N. J.

Peerless Rubber Co., 4129 W. Kinzie St., Chicago 24, Ill.

Pegasus Laboratories, 3690 Eleven Mile Rd., Berkley, Mich.
Electrohydraulic servomechanisms

Pelouze Mfg. Co., 1218 Chicago Ave., Evanston, Ill.
Scales and balances

Penberthy Injector Co., Div. Buffalo-Eclipse Corp., 1242 Holden Ave., Detroit 2, Mich.
Pressure and level gages and automatic controllers; UV transmitting glass

Penberthy Instrument Co., 4301 Sixth St., Seattle 8, Washington
Industrial and smoke periscopes

Penfield Manufacturing Co., Inc., P. O. Box 792, Meriden, Conn.

Penn Brass & Copper Co., Box 338, Erie, Pa.

Penn Instruments Div., Burgess-Manning Co., 4110 Haverford Ave., Philadelphia 4, Pa.
Flow meters; Venturi-tubes; electric and pneumatic transmission summation devices

Penn Optical & Instr. Co., 19542 Bristol St., Costa Mesa, Calif.
Precision optical parts; optical instruments; interferometers; spherometers; optical benches
(See advertisement on page 138)

Penn Precision Products, Inc., 501 Crescent Ave., Reading, Penna.
Precision rolled beryllium copper, phospor bronze, nickel, silver, brass, chromium copper, and stainless steel strip

Penna. Flexible Metallic Tubing Co., 72nd St. & Powers Lane, Philadelphia 42, Pa.

Penna. Pump & Compressor Co., Easton, Pa.
Instrument-air compressors; dry vacuum pumps

Perfex Div., General Controls Co., Iron Mountain, Mich.
Automatic temperature controls for oil burners, stokers, gas burners, refrigeration and air conditioning

Perkin-Elmer Corp., Main Ave., Stamford, Conn.
Optical instruments; scientific instruments

Perkin Engineering Corp., 345 Kansas St., El Segundo, Calif.
Regulated dc power supplies; ac line voltage regulators
(See advertisement on page 1)

Perkins & Son, Inc., B. F., Mullen Tester Div., P. O. Box 388, Holyoke, Mass.
Testers for leather, paper and textiles

Permag Corp., 214 Taafee Place, Brooklyn 5, N. Y.
Permanent magnets, precision ground, Alnico, in experimental or production quantities, standard or special sizes and Alnico grades
(See advertisement on page 141)

Permanent Magnet Co., Inc., Indianapolis 26, Ind.
Alnico, cobalt, and chrome permanent magnets

Permo Incorporated, 6415 N. Ravenswood Ave., Chicago 26, Ill.
Instrument pivots and contacts

Permutit Company, 330 W. 42nd St., New York 36, N. Y.
Water conditioning equipment; ion exchange resins; industrial waste treatment equipment; gas analyzing and indicating equipment

Peschel Electronics, Inc., 13 Garden St., New Rochelle, N. Y.
High voltage test sets (ac, dc, ac/dc); corona test sets; insulation testers, including very high voltage range
(See advertisement on page 238)

Pesco Products Co., 24700 North Miles Rd., Bedford, Ohio
Fractional-hp and geared motors; pumps

Peterson & Co., Inc., Leonard, 1222 Fullerton St., Chicago 14, Ill.
Laboratory furniture

Petrometer Corp., 43-22 10th St., Long Island City 1, N. Y.
Distant reading, liquid level tank gages
(See advertisement on page 26)

Pfaltz & Bauer, Inc., 350 5th Ave., New York 1, N. Y.
Laboratory control instruments

Phalo Plastics Corp., 25 Foster St., Worcester 8, Mass.
Plastic insulated wire, cable, and cord sets; wiring harnesses and assemblies

Phaostron Instrument and Electronic Company, 151 Pasadena Ave., S. Pasadena, Calif.
Hermetically sealed meters, panel meters, electronic test equipment, relays and deposited-carbon, hermetically sealed resistors
(See advertisement on page 239)

Phen-Trols, Inc., 1 Circle Lane, Rutherford, N. J.
Pyrometers; thermocouples; instrument and regulating transformers

Philadelphia Gear Works, Inc., G. St. and Erie Ave., Philadelphia, Pa.
Speed reducers; gears; flexible couplings; automatic valve operators

Philadelphia Pump & Machinery Co., Inc., Bustelton & Filmont Aves., Philadelphia, Pa.

Philadelphia Scientific Glass Co., 4 Eckard Ave., Abington, Pa.
Scientific and industrial instruments

Philadelphia Thermometer Co., 6th and Cayuga Sts., Philadelphia 40, Pa.
Instruments for temperature indication, control and regulation

Philamon Labs., 90 Hopper St., Westbury, L.I., N. Y.
Tuning fork resonators and frequency standards; frequency dividers; oscillators; power amplifiers

Philbrick Researches, Inc., George A., 30 Huntington St., Boston 16, Mass.
Computers and analogs

Philco Corp., Accessories Div., Tioga and C Sts., Philadelphia 34, Pa.
Electrical and electronic instrumentation; components; batteries

Philips Manufacturing Co., 3475 W. Touhy Ave., Chicago 45, Ill.
Vapor degreasers; instrument cleaning machines

Phillips & Co., H. A., 3255 W. Carroll Ave., Chicago 24, Ill.
Float controls; thermostatic valve controls; liquid level indicators; liquid return systems; solonoid valves

Phillips & Hiss Co., 1145 N. McCadden Place, Hollywood 38, Calif.
Precision drilling machines; pressure pickups

Phillips Control Corp., 59 W. Washington, Joliet, Ill.
Relays and solenoids

Phillips Mfg. Co., 3475 Touhy Ave., Chicago 45, Ill.

Phillips-Drucker, Route 1, Box 916B, Astoria, Oregon
Table and floor model, high speed, and refrigerated centrifuges

Phipps and Bird, Inc., 303 S. Sixth St., Richmond 5, Va.
Laboratory apparatus and chemicals

Phoenix Die Casting Co., 21 Illinois St., Buffalo 3, N. Y.

Phoenix Precision Instrument Co., 3803 N. 5th St., Philadelphia 40, Pa.
Light scattering photometers (molecular weight, particle size); Differential refractometer; forward-scattering aerosol and smoke photometers; continuous recording differential refractometers
(See advertisement on page 182)

Phosphor Bronze Corp., 30 Franklin St., Seymour, Conn.

Photo Chemical Products, Inc., 479 Walton Ave., New York 51, N. Y.

Photo Chemical Products of Cal., Inc., 1715 Berkeley St., Santa Monica, Calif.

Photo Research Corp., 837 N. Cahuenga Blvd., Hollywood 38, Calif.
Optical instruments and components; brightness spot meters; color densitometers; exposure meter testers
(See advertisement on page 176)

Photobell Co., Inc., 43 Vesey St., New York 7, N. Y.
Photoelectric equipment

Photocircuits Corporation, New Street, Glen Cove, L. I., N. Y.
Printed circuits and components

Photocon Research Products, 421 N. Foothill Blvd., Pasadena 8, Calif.
Precision mechanical instruments
(See advertisement on page 170)

Photogrametry Inc., 901 Pershing Drive, Silver Spring, Md.
Photographic and optical instruments and components

Photographic Products Inc., 1000 N. Olive St., Anaheim, Calif.
Microfilm, oscilloscope recording, scientific, radar, and computer cameras; control systems and program controllers

Photoplating Co., 215 N. E. 5th St., Minneapolis 13, Minn.
Aerial photo interpreting scales and rules

Photovolt Corp., 95 Madison Ave., New York 16, N. Y.
Photo-electric elements; photometers electronic timing devices; photo-electric colorimeters; photo-electric exposure meters; densitometers

Photron Instrument Co., 6516 Detroit Ave., Cleveland 2, Ohio
Oscillographs; amplifiers

Physical Research Labs., Inc., 1909 Park Ave., New York 35, N. Y.
Humidity and moisture-content measurement and automatic control

Physics Research Laboratories, 507 Hempstead Turnpike, West Hempstead, N. Y.
Electrical and electronic instrumentation
(See advertisement on pages 190, 238)

PIC Design Corp., 160 Atlantic Ave., Lynbrook, L.I., N. Y.

Pickard & Burns, Inc., 240 Highland Ave., Needham, Mass.
Amplifiers

Picker X-Ray Corp., 25 South Broadway, White Plains, N. Y.
X-ray equipment

Pike & Co., E. W., 492 North Ave., Elizabeth 3, N. J.
Illuminated magnifiers and microscopes

Pimex, Inc., 2 E. 82nd St., New York 28, N. Y.
Electric furnaces; reflecting galvanometers; standard resistances

Pioneer Electronics Corp., 2235 S. Carmelina St., W Los Angeles 64, Calif.

Pipe Machinery Co., 930 E. 70th St., Cleveland, Ohio
Inspection gages

Pitometer Log Corp., 237 Lafayette St., New York 12, N. Y.
Pilot tube flowmeters

Pittsburgh Instrument & Machine Co., 1026 Reedsdale St., Pittsburgh 12, Pa.
Brinell machines; alternating impact machines; surveying instruments

Pittsburgh Lectrodryer Corp., Division of McGraw Electric Co., P. O. Box 1766, Pittsburgh 30, Pa.
Instrument air dryers

Plamondon Magnetics Co., 1850 Hubbard St., Chicago 22, Ill.

Planet Mfg. Co., 225 Belleville Ave., Bloomfield, N. J.
Electrolytic capacitors

Plastic Capacitors, Inc., 2620 N. Clybourne, Chicago 14, Ill.
Paper and plastic dielectric capacitors; high-voltage dc power supplies; pulse forming networks; metal, glass and bakelite containers

Plastic Service Guild, 233 Condor St., East Boston 28, Mass.
Chemically resistant plastic coatings for metal

Plumb Co., Inc., D. S., 73-77 Norfolk St., Newark 3, N. J.
Pressure gage movements; water meter registers

Plummer & Kershaw, 2757 Frankford Ave., Philadelphia 34, Pa.
Optical parts

Pneumatic Corp., 2516 Wilkinson Blvd., Charlotte, N. C.
Mounting bases; shockmounts; cabinets; chassis; panels

Pneumatic Scale Corp., Ltd., Quincy, Mass.
Automatic filling machines; scales

Pneu-Trol Devices, Inc., 1436 N. Keating Ave., Chicago 51, Ill.
Automatic time-control systems; control valves

Podbielniak, Inc., 341 East Ohio St., Chicago 11, Ill.
Scientific and industrial laboratory apparatus

Polarad Electronics, Co., 43-20 34th St., Long Island City 1, N. Y.
Amplifiers; audiofrequency equipment; oscillators; remote control equipment; spectrum analyzers

Polarized Light-Photoelastic Co., 96 Tompkins Circle, Staten Island 1, N. Y.
Photoelastic polariscopes

Polarizing Instrument Co., Buckhout St., Irvington, N. Y.
Photoelasticity apparatus

Polaroid Corp., 730 Main St., Cambridge 39, Mass.

Pollak Corp., Joseph, 85 Freeport St., Boston 22, Mass.
Relays; electromechanical components
(See advertisement on page 185)

Polymer Corp. of Pennsylvania, Reading, Pa.
Stock shapes of nylon, Teflon, other specialty plastics for bearings, gears, bushings, valve seats, washers, seals, rollers, etc.; processing powders; coatings

Polyphase Instrument Co., 701 Haverford Rd., Bryn Mawr, Pa.
Stress-strain recorders; electrical testing and measuring instruments; transistor testers; analyzers; components; pulse transformers; filters

Polytechnic Research & Developemnt Co., Inc., 202 Tillary St., Brooklyn, N. Y.
Microwave uhf-vhf test equipment; evaporated film resistors

Poole Instruments, Inc., 150 Express St., Dallas, Texas
Instruments for inspection of physical dimensions, fluid density, and physical volume by use of sound waves

Popper & Sons, Inc., 300 Fourth Ave., New York 10, N. Y.
Liquid filling equipment; marking and printing machinery; laboratory supplies

Porter, Inc., George K., Box 216, Hatboro, Pa.
Glass blowing; precision cylindrical, and tapered tubing

Portman Instrument Co., Town Dock Road, New Rochelle, N. Y.
Optical comparators, projectors and gages; microscopes

Posen & Kline Tube Co., Whitehall Rd. & Township Line, P. O. Box 549, Norristown, Pa.
Capillary and Bourdon tubing

Post Company, Frederick, P. O. Box 803, Chicago 90, Ill.
Instruments and equipment for architects and engineers

Post Machinery Co., Electronic Products Div., 145 Elliott St., Beverly, Mass.
High speed electronic counter; lineal footage counters

Potter Aeronautical Co., P. O. Box 532, Route No. 22, Union, N. J.
Aircraft power-plant instruments; industrial flowmeters; frequency meters
(See advertisement on page 111)

Potter Co., 1950 Sheridan Rd., North Chicago, Ill.
Capacitors

Potter & Brumfield Inc., Princeton, Ind.
Relays

Potter Instrument Co., 115 Cutter Mill Road, Great Neck, L. I., N. Y.
Electronic counting, timing, control computing, recording and digital data handling equipment; high-speed printers, magnetic data storage systems; magnistors

Power Designs, Inc., 119-22 Atlantic Ave., Richmond Hill 19, N. Y.
Automatic voltage and current regulators; amplifiers; power supplies
(See advertisement on page 239)

Power Supply Corp. of America, 12820 Vine Blvd., Los Angeles 66, Calif.

Powers, George, 791 Tremont St., Boston 18, Mass.

Powers Regulator Co., 3400 Oakton St., Skokie, Ill.
Temperature, humidity, and pressure controllers and valves; indicators, and recorders; automatic control systems for heating and air conditioning
(See advertisement on page 5)

Powrex Switch Co., 36 Pleasant St., Watertown 72, Mass.
Mercury switches

Practo Photo Accessories Corp., 383 Pearl St., Brooklyn 1, N. Y.

Praktica Co., Inc., The, 705 Bronx River Rd., Bronxville 8, N. Y.
Cameras and accessories

Pratt & Whitney Co., Inc., Div. Niles-Bement Pond Co., West Hartford 1, Conn.
Machine shop instruments

Precise Development Corp., 2 Neil Court, Oceanside, L. I., N. Y.
Electrical and electronic instrumentation

Precise Measurements Co., 942 Kings Highway, Brooklyn 23, N. Y.
High-voltage power supplies; electrical circuit symbol stamps
(See advertisement on page 50)

Precise Products Co., 1328 Clark St., Racine, Wisc.
High speed milling machines; hardness testers

Precision Apparatus Co., Inc., 70-31 84th St., Glendale 27, L. I., N. Y.
Radio test instruments

Precision Castings Co., Inc., Drawer 1077, Syracuse 1, N. Y.

Precision Diamond Tool Co., Box 274, Elgin, Ill.
Diamond tools; grinding wheels

Precision Electronics, Inc., 9101 King St., Franklin Park, Ill.
High-fidelity pre-amplifiers; amplifiers and tuners; PA systems; electronic test instruments

Precision Gage & Tool Co., 320 East 3rd St., Dayton 2, Ohio
Machine shop gages

Precision Glass Products Co., 518 W. Rising Sun Ave., Philidelphia 40, Pa.
(See advertisement on page 121)

Precision Manufacturing Co., 48-15 108th St., Corona 68, N. Y.

Precision Meter Co., Inc., 126 Greenpoint Ave., Brooklyn 22, N. Y.
Electrical measuring instruments

Precision Paper Tube Co., 2033 W. Charleston St., Chicago 47, Ill.

Precision Parts Co., Carter Radio Div., 213 Institute Place, Chicago 10, Ill.

Precision Products Co. Inc. of Waltham, 26 Bedford St., Waltham 54, Mass.
Hair springs and hair spring assemblies
(See advertisement on page 201)

Precision Products, Inc., 530 So. Quaker, Tulsa, Okla.
Time switches

Precision Radiation Instruments, Inc., 4223 W. Jefferson Blvd., Los Angeles 16, Calif.
Geiger counters and scintillators; high fidelity tuners & amplifiers

Precision Recording Chart Co., A division of Technical Paper Co., Inc., 2430 Linden Ave., E., Linden, N. J.
Instrument charts in rolls, accordian folded, printed, punched, etc., on sensitized or unsensitized paper

Precision Resistance Co., Central Park Ave., Box 116, Yonkers, N. Y.
Fixed and variable resistors; negative-temperature-coefficient resistors

Precision Resistor Co., Inc., 109 U. S. Highway #22, Hillside 5, N. J.
Resistors

Precision Rubber Products Corp., 3110 Oakridge Dr., Dayton 7, Ohio
"O" rings; rubber washers

Precision Scientific Co., 3737 Cortland St., Chicago 47, Ill.
Standard and custom-built laboratory equipment

Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia 30, Pa.

Precision Tube Company, Wissahickson Ave. & Church Rd., North Wales, Pa.
Fine tubing and metal shielded wire

Preco Co., 14159 Steel Ave., Detroit 27, Mich.
Hairsprings; precision gears; instrument staffs, pivots, pinions, etc.

Preferred Utilities Mfg. Corp., 1860 Broadway, New York, N. Y.
Boiler plant instruments

Preis Engraving Machine Co., H. P., 651 State Highway 22, Hillside, N. J.
Engraving, etching, marking and printing machines, tools and supplies
(See advertisement on page 136)

Preiser Co., Inc., B., P. O. Box 6118, Charleston 2, W. Va.
Laboratory equipment and supplies

Premier Metal Products Co., 337 Manida St., New York 59, N. Y.
Instrument chassis and cabinets
(See advertisement on page 179)

Premier Metal Works, Inc, 1616 S. Clinton St., Chicago 16, Ill.

Premier Research Laboratories, Inc., 79 Seventh Ave., New York 11, N. Y.
Piezo electric quartz and tourmaline crystals; reactance and capacity meters

Presin Co., 12128 W. Pico Blvd., Los Angeles 64, Calif.
Program controllers; counters; totalizers; tachometers

Pressure Products Industries, Inc., Hatboro, Pa.
Pressure instrumentation; pumps; autoclaves; valves; components

Presto Recording Corp., Paramus, N. J.
Magnetic tape recorder

Price Electric Corp., Frederick, Md.
Relays

Printed Electronics Corp., 7 North Ave., Natick, Mass.

Pritchard & Co. of Calif., J. F., 4625 Roanoke Pkwy., Kansas City 12, Mo.
Instrument air dryers

Probescope Co., 44-05 30th Ave., Long Island City 3, N. Y.
Spectrum analyzers; phase analyzers; synchronous sweep generators; miniature and multiple channel oscilloscopes

Process Control Co., 2 East End Ave., New York 21, N. Y.
Designers and builders of electrical, mechanical and electronic controls for automatic equipment and processes

Process & Instruments, 15 Stone Ave., Brooklyn 33, N. Y.
Electronic, optical, and mechanical instruments for industrial and research use

Production Instrument Co., 710 W. Jackson Blvd., Chicago 6, Ill.
Electric & mechanical counting, timing & recording devices & actuating switches

Products Research Co., 5426 San Fernando Rd., Glendale, Calif.

Progressive Service Co., 2743 Locust St., St. Louis, Mo.
Dimensional gages

Proportioneers, Inc., 345 Harris Ave., Providence 1, R. I.
Automatic controlling and proportioning equipment

Propulsion Development Labs., 1120 Segundo Blvd., El Segundo, Calif.
Gas flow pressure and temperature pick-up probes and rakes; development and calibration of new types
(See advertisement on page 213)

Pyle-National Co., 1334 N. Kostner Ave., Chicago 51, Ill.
Connectors; turbo generators

Pyramid Electric Co., 1445 Hudson Blvd., North Bergen, N. J.

Pyramid Instrument Corp., 630 Merrick Rd., Lynbrook, N. Y.
Electrical instruments; pyrometers

Pyroferric Co., Inc., 621 E. 216 St., Bronx 67, N. Y.
powdered iron cores; mechanical assemblies

Pyrofilm Resistor Co., 8 Whippany St., Morristown, N. J.

Pyrometer Instrument Co., Inc., Bergenfield 4, N. J.
Precision pyrometers for every plant and laboratory temperature measuring problem
(See advertisement on page 177)

Pyrometer Service Co., 228 River Rd., Arlington, N. J.
Pyrometer tubes; thermocouples

Q

QOS Corp., 39 W. 60th St., New York 23, N. Y.

Quaid Fabricators Inc., Spring Garden and Fillmore, Palmyra, N. J.
Panels; autoclaves

Quality Control Corp., 401 Broadway, New York 1, N. Y.
Precision measuring tools

Quality Electric Co., 2212 S. Hill St., Los Angeles, Calif.
Air/fuel ratio exhaust gas analyzers

Quartz Products Corp., 688 Somerset St., Watchung, N. J.

R

RCA Division, Radio Corporation of America, Camden, N. J., Tube Div., 415 S. Fifth St., Harrison, N. J.
Radio and electronic equipment for all purposes including laboratory and industrial apparatus

R.C.L. Mfg. Co., New Jersey Ave., Riverside, N. J.
Resistors and rheostats

RHO Engineering Co., 2242 Sepulveda Blvd., Los Angeles 64, Calif.
Potted circuits; potting compounds; resistors: encapsulated, precision, wirewound, subminiature
(See advertisement on page 279)

RKL Valve & Mfg. Co., Route 38 and Rudderrow Ave., Maple Shade, N. J.
Manual, air, electrically and hydraulically operated pinch type valves for all types of material handling and flow regulation
(See advertisement on page 235)

R & M Mfg. Co., Royal Oak, Mich.
Machine shop gages

R-P & C Valve Div., American Chain & Cable Co., Inc., Reading, Pa.

RS Electronics Corp., P. O. Box 368, Station A, Palo Alto, Calif.
Radar sub-assemblies; laboratory test equipment; radar scanners

R-S Products Corp., 4523 Germantown Ave., Philadelphia 44, Pa.
Butterfly valves

Racine & Co., Inc., Jules, 20 West 47th St., New York 36, N. Y.
Stop watches; chronographs; laboratory and sporting goods; pocket and wrist chronographs
(See advertisement on page 221)

Radex Corp., 2076 Elston Ave., Chicago 14, Ill.
Electrostatic precipitators; odor absorbers; test equipment

Radiaphone Co., 600 E. Evergreen Ave., Monrovia, Calif.
Electrical and electronic instrumentation

Radiation, Inc., P. O. Drawer 37, Melbourne, Fla.
Force-measuring equipment, aircraft test instruments; data reduction equipment

Radiation Counter Labs., 5122 W. Grove St., Skokie, Ill.
Geiger-Mueller counters; radium detectors

Radiation Instrument Development Lab., 5737 S. Halsted St., Chicago 21, Ill.
Radioactivity detecting and measuring instrumentation; laboratory apparatus; vacuum gages

Radiation Research Corporation, 140 E. 59th St., New York 22, N. Y.
Nuclear batteries; special purpose capacitors

Radio City Products, Inc., Centre & Glendale Sts., Easton, Pa.
Electrical and radio testing instruments and accessories

Radio Corporation of America, Building 15-1, Camden, N. J.
Laboratory and industrial test instruments including r-f signal generators, impedance bridges and electronic voltmeters

Radio Frequency Laboratories, Inc., Booton 2, N. J.
Test and service equipment for electrical instrument calibration; crystal impedance meters; telemetering; telegraph and control terminals
(See advertisement on pages 101, 140, 211)

Radio Receptor Co., Inc., 251 West 19th St., New York 11, N. Y.
Selenium rectifiers; germanium diodes; dielectric heating equipment; communications equipment; navigational aids; microwave instrumentation and equipment

Radio Shack Corp., 167 Washington St., Boston, Mass.
Electronic equipment distributor

Radioactive Products, Inc., 6540 W. Congress St., Detroit 26, Mich.
Radiation survey instruments; electrical and testing instruments

Rahm Instruments, Inc., 237 LaFayette St., New York 12, N. Y.
Potentiometer transducers for pressure, altitude, air speed and acceleration
(See advertisement on page 35)

Rainhart Co., P. O. Box 4065, Austin 51, Texas
Soil compactors; concrete and soil testing instrumentation

Ram Meter, Inc., 1100 Hilton Rd., Ferndale 20, Mich.
Instrument shunts; power regulating equipment; thermal switch testers; telemetering load cycle counters

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RHO ENGINEERING COMPANY
2242 SEPULVEDA BLVD., LOS ANGELES 64, CALIF.

For more information circle **435** on inquiry card.

Ramapo Engineering Co., 1 Dey Lane, Riverdale, N. J.
Flow transducers (stainless steel), strain gage translated for measurement of transients; pressures up to 5000 psig, bi-directional measurement available
(See advertisement on page 215)

Ramo-Wooldridge Corp., Electronic Instrumentation Div., 5730 Arbor Vitae, Los Angeles 45, Calif.
Specialized electronic test equipment

Ranco, Inc., 601 West Fifth Ave., Columbus 1, Ohio
Refrigeration controls

Ransom Laboratories, John H., 6419 Crenshaw Blvd., Los Angeles 43, Calif.
Optical instruments and parts; modulation reticles

Ransom Research, P. O. Box 382, San Pedro, Calif.

Rapid Electric Co., 2881 Middletown Rd., New York 61, N. Y.
Power supplies; rectifiers; components

Rapid Specialties Co., 327 W. Huron St., Chicago 10, Ill.
Test clips for motors, coils, electrical units
(See advertisement on page 145)

Rapidesign, Inc., 517 State St., Glendale, Calif.

Rascher & Betzold, Inc., 730 N. Franklin St., Chicago 10, Ill.
Laboratory supplies

Rattray & Co., Inc., George, 166-08 Myrtle Ave., Richmond Hill 18, N. Y.
Voltage-dividing resistors

Rauland Corp., 4245 N. Knox Ave., Chicago 41, Ill.
Cathode-ray tubes

Rauland-Borg Corp., 3513 W. Addison St., Chicago 18, Ill.
Amplifiers; audio-frequency equipment; microphones

Rawson Electrical Instrument Co., Inc., 112 Potter St., Cambridge, Mass.
Magnetic fluxmeters; electrostatic voltmeters; sine-cosine potentiometers; low power factor watt meters

Ray-O-Vac Co., See Specialty Battery Div.

Rayedon Co., 234 Rockingham Rd., Rosemont, Pa.

Raybestos-Manhattan, Inc., Manhattan Rubber Div., 61 Willett St., Passiac, N. J.
Molded products; hose; abrasive and diamond wheels; packings; friction material

Raycon Corp., 248 Harbor Blvd., Belmont, Calif.
Counters

Raydyne Corp., 920 W. Laurel St., Springfield, Ill.
Dynamic balancing machines

Raytheon Mfg. Co., 100 River St., Waltham 54, Mass.
Automatic and manually controlled rectifiers for all communication, industrial or laboratory applications; marine equipment; industrial equipment; communication equipment; electronic components

Raytheon Mfg. Co., Equipment Sales Div., 100 River St., Waltham, Mass.
Radar systems and components; aircraft and marine navigation instrument; electronic components

Raytheon Mfg. Co., Receiving and Cathode Ray Tube Opns., 55 Chapel St., Newton, Mass.
Electron tubes; cathode-ray tubes

Rea Co., Inc., J. B., 1723 Cloverfield Blvd., Santa Monica, Calif.
Research, development and manufacture of electronic automatic systems for military and commercial applications

Rea Magnet Wire Co., Inc., E. Pontiac St., Fort Wayne 4, Ind.
Copper enameled magnet wire—AWG sizes #10-#50

Recora Co., 6100 S. Archer Rd., Summit, Ill.
Floor-mat type extended area electrical switches; extended length hydraulic switches; control systems

Redington Co., F. B., 112 S. Sangamon St., Chicago 7, Ill.
Counters: production, revolution, stroke

Red Point Corp., 1907 Riverside Drive, Glendale 1, Calif.
Impregnating equipment and materials; automatic encapsulating machines; high vacuum pumps
(See advertisement on page 102)

Redmond Co., Inc., Owosso, Mich.
Fractional-hp motors

Reed & Reese, Inc., 717 N. Lake Ave., Pasadena, Calif.
Transformer, relay, solenoid magnet coils, and transformers to specification

Reed Research, Inc., 1048 Potomic Ave., N. W., Washington 7, D. C.
Computers; oscillographs; analyzers

Reeves Hoffman Corp., 321 Cherry St., Carlisle, Pa.
Piezoelectric and quartz crystals
(See advertisement on page 145)

Reeves Instrument Corp., 215 E. 91st St., New York 28, N. Y.
Computers; allied components

Reeves Pulley Div., Reliance Electric Co., 1225 Seventh St., Columbus, Ind.
Speed control equipment

Reeves Soundcraft Corp., 10 E. 52nd St., New York 22, N. Y.

Refinery Supply Co., 621 East Fourth St., Tulsa 3. Okla.
Gas testing instruments and specialties for oil and gas industry laboratory supplies

Reflectone Corp., Post Rd., Stamford, Conn.

Refrigeration Systems, Inc., 646 W. Washington St., Chicago 6, Ill.
Temperature and humidity cabinets, cloud-and-pour oil testers

Regal Instrument Co., Inc., 1650 Coney Island Ave., Brooklyn 30, N. Y.

Reiner Electronics Co., Centre & Glendale Sts., Easton, Pa.
Electronic testing equipment

Reisner Mfg. Co., Inc., W. H., Hagerstown, Md.

Relay Sales, P.O. Box 186, West Chicago, Ill.
Distributor of relays, timers, switches, etc.

Relay Service Co., 1310-12 N. Pulaski Rd., Chicago 51, Ill.
Relays; magnetic coils; mechanical leaf switches

Reliable Instrument Co., Inc., 505 North Eighth St., Philadelphia 23, Pa.
Temperature, humidity, and dimensional instrumentation

Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio
Motors; generators; tachometers; regulators

Reliance Gauge Column Co., 5902 Carnegie Ave., Cleveland 3, Ohio
Steam specialties

Reliance Instr. Mfg. Corp., 190 Glen Cove Ave., Glen Cove, L. I., N. Y.
Automatic control systems for furnaces, boilers, reactors, etc; valve-operating devices

Reliant Industries, 4947 Firestone Blvd., South Gate, Calif.
Dimensional gaging equipment

Remco, Inc,, Zelienople, Pa.
Liquid level indicators

Remington Rand, Inc., 315 Fourth Ave., New York 10, N. Y.
Computers; microfilm cameras

Remler Co., 2101 Bryant St., San Francisco 10, Calif.
Airbourne public address systems; microphones; handsets, etc.; transistorized amplifiers

Renick Co., L. C., 3820 S. 59th Court, Cicero 50, Ill.
Machine divided scales, verniers and dials; linear and circular machine dividing; precision reticles and glass scales; machine engraving
(See advertisement on page 192)

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NEWTON HIGHLANDS 61, MASS.

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Reon Resistor Corp., 117 Stanley Ave., Yonkers, N. Y.
Resistors; resistance testers

Republic Electronics Industries Corp., 31 West 27th St., New York 1, N. Y.

Republic Flow Meters Co., 2240 Diversey Parkway, Chicago 47, Ill.
Remote reading flow meters; power plant, industrial instruments for flow, level, pressure, draft, temperature and CO_2; automatic boiler controls; regulators; valves; desuperheater
(See advertisement on pages 70, 100, 112, 132, 175, 234)

Republic Gage Co., 2228 Fenkel Ave., Detroit 38, Mich.
Dimensional gages

Republic Lens Co., 31 East 169th St., Bronx 52, N. Y.

Republic Mfg. Co., 15655 Brook Park Rd., Cleveland 11, Ohio
Relief valves; regulating valves; turn-and-bank indicators; pressure snubbers
(See advertisement on page 235)

Republic Rubber Div., Lee Rubber & Tire Corp., Youngstown 1, Ohio
Industrial rubber products including hose, belting, packing, etc.

Rese Engineering Co., 731 Arch St., Philadelphia 6, Pa.

Electrical and electronic instrumentation, digital computer components; high-speed digital memory equipment

Research Appliance Co., Route 8 & Craighead Rd., Allison Park, Penna.
Chemical feed pumps; automatic air samplers
(See advertisement on page 59)

Research Control Instrument Co., P. O. Box 615, W. Tulsa 7, Okla.

Research Controls, Box 5035, Tulsa, Okla.
Automatic and manual controllers; valves; components

Research Development Manufacture, Inc., 429 E. Collum St., Philadelphia 44, Pa.
Precision mechanical components; gears, cams, etc.

Research Engineering Inc., Plainfield, N. J.

Research Equipment Corp., 1135 Third St., Oakland, Calif.
Chromatography and electrophoresis apparatus

Research Specialties Co., 2005 Hopkins St., Berkeley 7, Calif.
Lab instrumentation

Resistance Products Co., 914 S. 13th St., Harrisburg, Pa.
Resistors, wire-wound, high voltage

Resistoflex Corp., 39 Plansoen St., Belleville 9, N. J.

Resistors, Inc., 5226 West 26 St., Chicago 50, Ill.
Resistors, adjustable, variable and wire wound

Retron Corp., 717 N. Lake Ave., Pasadena, Calif.
Linear motion potentiometers and multi-turn potentiometers

Revco Inc., 1900 Lyndale Ave., South, Minneapolis 5, Minn.
Automatic speed controllers; variable-speed drives

Revere Copper and Brass Inc., 230 Park Ave., New York 17, N. Y.
Copper; copper alloys; aluminum alloys

Revere Corporation of America, P. O. Box 304, Walingford, Conn.
Thermocouples for liquids, air, metal, hot gases; thermocouple wire, harnesses and leads; Pitot tubes (shielded and unshielded) engine and flight test recording accessories; aviation fuel system components

Rex Corp., Hayward Rd., West Acton, Mass.

Rex Rheostat Co., 3 Foxhurst Rd., Baldwin L. I., N. Y.
Protected and unprotected slide-contact rheostats and adjustable, wire wound resistors

Reynolds Electric Co., 3000 River Rd., River Grove, Ill.
Thermostatic and electrical motor operated flashers

Reynolds Gas Regulator Co., Andersin, Inc.
Automatic valves and regulators

Reynolds Metals Co., 2500 S. 3rd St., Louisville 1, Ky.
Aluminum tubing and products

Rheem Manufacturing Co., Government Products Div., 9236 E. Hall Rd., Downey, Calif.
Amplifiers; voltage regulators; power suppliers; temperature systems for airborne applications; telemetering and data handling systems

Rhodes, Inc., H. H., 30 Bartholomew Avev. Hartford 6, Conn.
Mechanical Interval time switches; bell signal timers

Rhodes & Co., James H., 157 W. Hubbard St., Chicago 10, Ill.

Richards Co., Inc., Arklay S., 52 Winchester St., Newton Highland 61, Mass.
Thermocouples, lead wire and protection tubes
(See advertisement on page 280)

Richardson-Allen Corp., 116-15 15th Ave., College Point, L. I., N. Y.
Timers and time switches

Richardson Co., 27th Ave., & Lake St., Melrose Park, Ill.
Plastic and rubber products; battery parts

Richardson Co., Lockland, Cincinnati 15, Ohio

Richardson Camera Co., 171 West Magnolia, Burbank, Calif.

Richardson Scale Co., Clifton, N. J.
Automatic weighing machinery

Richmont, Inc., 922 S. Myrtle Ave., Monrovia, Calif.
Torque instruments and tools

Riehle Testing Machine Division, American Machine & Metals Inc., East Moline, Ill.
Testing machines and testing instruments for tension, compression, bending, torsion, shear, hardness, wear

Rieker Instrument Co., 1919 Fairmount Ave., Philadelphia 30, Pa.
Scientific instruments

Riester & Thesmacher Co., 1526 W. 25th St., Cleveland 13, Ohio

Rimat Gage Co., 21 W. Dayton St., Pasadena 2, Calif.
Dial bore gages, micrometers; bar gages

Ripley Co., Inc., Factory St., Middletown, Conn

Ritchie & Co., W. C., 8807 Baltimore Ave., Chicago 17, Ill.

Ritchie & Son, E. S., 112 Cypress St., Brookline 46, Mass.
Marine instruments

Riverbank Laboratories, P. O. Box 65, Geneva, Ill.
Tuning forks

Riverside Mfg. & Electrical Supply Co., 10221 Michigan Ave., Dearborn, Michigan
Switches

Rivett Lathe & Grinder, Inc., 18 Riverview Rd., Brighton 35, Mass.

Robbins Aviation 1735 W. Florence Ave., Los Angeles 47, Calif
Dehumidifiers: hi-lo flows, hi-lo pressures; valves: leakproof, metering, instrument, shutoff, hi-vacuum to 6000 psig
(See advertisement on page 125)

Robbins & Myers, Inc., 1345 Lagonda Ave., Springfield 99, Ohio
Frequency converters; fractional-hp motors

Robertshaw-Fulton Controls Co., 110 E. Otterman St., Greensburg, Pa.
Temperature controllers and regulators

Robertson & Co., John H., 4153 W. Belmont Ave., Chicago 41, Ill.
Scientific glassware, laboratory apparatus

Robertson & Ruth, Box 534, Elmhurst, Illinois
Instrument and electronic hardware; dial hole-cutting saw

Robins Industries Corp., 214-26 41st Ave., Bayside 61, N. Y.
Magnetic recording tap cutter-splicers

Robinson Aviation Inc., Teterboro Airport, Teterboro, N. J.
Anti-vibration mountings

Robinson Orifice Fitting Co., 2830 Lugo St., Los Angeles 23, Calif.
Orifice fittings and plates
(See advertisement on page 156)

Robotron Corp., 21300 W. 8 Mile Rd., Detroit 19 Mich.

Rochester Electronics Co., Inc., P. O. Box 227 Penfield, N. Y.
Decade resistors

Rochester Mfg., Inc., 100 Rockwood St., Rochester 10, N. Y.
Pressure and liquid level indicators and thermometers

Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

Rockwell Co., Stanley P., 296 Homestead Ave., Hartford 5, Conn.
Dilatometers

Rockwell Co., W. S., 200 Eliot St., Fairfield, Conn.
Butterfly control valves; industrial furnaces and ovens

Rockwell Engineering Co., 4063 N. New Jersey St., Indianapolis 5, Ind.
Special instruments to customers specifications

Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Fluid meters; hydraulic pumps; gas distribution systems

Rockwood Sprinkler Co., 38 Harlow St., Worcester 5, Mass.
Air operated valves; pipe detectors

Rodale Mfg. Co., Inc., Emmaus, Pa.
Electrical wiring devices

Roebling's Sons Co., John A., 640 S. Broad St., Trenton 2, N. J.

Rodon, Inc., Easton Rd., Neshaminy, Pa.
Cable reels
(See advertisement on page 73)

Roemer Drug Co., 606 N. Broadway, Milwaukee 2, Wis.
Laboratory supply house

Rogan Brothers, 8025-33 Monticello Ave., Skokie, Ill.
Knobs molded from stock molds foe all types of instruments; parts molded to manufacturers' specifications
(See advertisement on page 130)

Roller-Smith Corp., 1825 W. Market St., Bethlehem, Pa.
Instruments (indicating and graphic) air and oil circuit breakers, relays, switchboards, precision balances, transformers, instrument and control switches

Rollin Co., 2010 Lincoln Ave., Pasadena 3, Calif.
Electronic test equipment

Rome Cable Co., Rome, N. Y.

Ronar, Inc., 1316 Sherman Ave., Evanston, Ill.
Electronic stethoscope; polariscopes; electrical and electronic components

Roots-Connersville Blower Co., Connersville, Ind.
Positive-displacement fluid meters; pumps; blowers; gas generators

Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, Mich.
Valves

Rotating Components Inc., 267 Green St., Brooklyn 22, N. Y.
Sub-fractional-hp motors; fans; blowers; servo motors; geared motors; alternators

Rotron Controls Corp., 7-9 Schoomaker Lane, Woodstock, N. Y.
Fractional-hp motors

Roy Co., Milton, 1300 E. Mermaid Lane, Philadelphia 18, Pa.
Positive displacement controlled volume pumps; chemical feed systems

Royson Engr. Co., 100 N. Penn St., Hatboro, Pa.
Chart identification printers; special recorders; electro-mechanical devices

Rubatex Division, Great American Industries, Inc., Bedford, Virginia
Cellular rubber products

Rubicon Co., Ridge Ave. at 35th St., Philadelphia 32, Pa.
Precision electrical instruments: potentiometers, galvanometers, bridges; resistance standards; photoelectric colorimeters; transmission dynamometers

Rudolph & Sons, O. C., P. O. Box 446, Caldwell, N. J.
Optical instruments

Rueckert Manufacturing Co., 83 King St., East Greenwich, R. I.
Wood and imitation covered cases for tools, instruments and optical goods

Ruge Associates, Inc., Arthur C., 733 Concord Ave., Cambridge 38, Mass.
Resistance thermometer elements

Rupp & Bowman Co., 315 Superior St., Toledo 3, Ohio
Laboratory supplies

Ruska Instrument Corp., 4607 Montrose Blvd., Houston 6, Texas
Geophysical instruments

Rust Industrial Company, 130 Silver St., Manchester, N. H.

Rutherford Electronics Co., 3707 S. Robertson Blvd., Culver City, Calif.
One megacycle continuously controllable single and multiple pulse generators; analog and digital delay generators; millimicrosecond time measuring equipment

Rutteo Mfg. Co., 105-20 Metropolitan Ave., Forest Hills, N. Y.
Hydrometers; thermometers

Ryan Recording Thermometer Co., 851 Poplar Pl., Seattle 44, Wash.
Portable recording thermometers for perishables in transit or storage

Ryan Tool & Engineering Co., 19159 John R. St., Detroit 3, Mich.
Height gages; fixtures; special machinery

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Sage Electronics Corp., 302 N. Goodman St., Rochester 7, N. Y.
Miniature wire-wound, power resistors

Sampson Chemical & Pigment Corp., 2830 W. Lake St., Chicago 12, Ill.
Phosphorescent and fluorescent coatings

San Fernando Electric Mfg. Co., 1509 First St., San Fernando, Calif.
Hermetically sealed capacitors; rf filters; precision wire-wound single and multi-turn potentiometers

Sanborn Co., 39 Osborne St., Cambridge 39, Mass.
Electronic instruments
(See advertisement on page 33)

Sanders Associates, Inc., 137 Canal St., Nashua, N. H.

Sandsteel Spring Div., Sandvik Steel Inc., 1702 Nevins Rd., Fair Lawn, New Jersey

Sandvik Steel, Inc., 47 Warren St., New York 7, N. Y.
Special springs
(See advertisement on page 201)

Sandy Mfg. Co., 26 Maple Ave., Sellersville, Pa.

Sangamo Electric Company, 1022 Converge Ave., Springfield, Ill. Capacitor Div., Marion, Ill.
Electric meters; instrument transformers; time switches and radio condensers

Sangamo Generators, Inc., 2110 Clear Lake Ave., Springfield, Ill.
Motors, generators, inverters

Santay Corp., 351 No. Crawford Ave., Chicago 24, Ill.

Sarco Company, Inc., 250 Fifth Ave., New York 1, N. Y.
Temperature and pressure regulators; steam traps; strainers

Sargent & Co., 4647 Foster Ave., Chicago 30, Ill.
Laboratory supplies and chemicals

Sauereisen Cement Co., 1045 N. Canal St., Pittsburgh 15, Pa.
Coatings and cements

Sawyer Bailey Corp., 1559 Niagara St., Buffalo 13, N. Y.
Air compressors

Saxl Instrument Co., Harvard, Mass.
Tension and torque measuring instruments

Saxonburg Ceramics, P. O. Box 157, Saxonburg, Pa.
Insulation testers; insulating materials; industrial ceramics

Scaico Controls, Inc., C. C. Pump Mfg. Div., 315 Madison St., Palmyra, N. J.

SCAM Instrument Corp., 1811 W. Irving Park Rd. Chicago 13, Ill.
Annunciator and alarm systems

Scharr & Co., 754 W. Lexington St., Chicago 7, Ill.
Laboratory supplies

Schade Valve Mfg. Co., 2527 N. Bodine St., Philadelphia 33, Pa.
Automatic regulating valves

Schaefer Bros., Co., 1059 W. 11th St., Chicago 7, Ill.
Rheostats

Schaevitz Engineering, Crescent Blvd. at Drexel Ave., Camden, N. J.
Accelerometers, extensometers, position indicators, remote metering equipment; differential transformers

Schaffer Poidometer Co., 2828 Smallman St., Pittsburgh 22, Pa.
Scales

Schauer Mfg. Corp., 4500 Alpine Rd., Rossmoyne, Cincinnati 36, Ohio
Battery chargers; battery eliminators; rectifiers

Scherr Co., Inc., George, 200 Lafayette St., New York 12, N. Y.
Optical measuring and inspection equipment
(See advertisement on page 96)

Scherr Optical Tools, Inc., 200 Lafayette St., N. Y. 12, N. Y.
Shop instruments and components

Schneider-Cogswell, Inc., 1849 N. Halstead St., Chicago 14, Ill.
Precision lenses and prisms

Schnitzer Alloy Products Co., 537 Pine St., Elizabeth 1, N. J.

Schrader's Son, A., 470 Vanderbilt Ave., Brooklyn 38, N. Y.
Pneumatic cylinders; safety valves; regulating valves; solenoid valves

Schueler & Co., 75 Cliff St., New York 38, N. Y.

Schutte & Koerting Co., Cornwells Heights, Bucks County, Pa.
Rotameters
Schutte Optical Co., Inc., 16 Dowling Place, Rochester 5, N. Y.
Optical instruments and components

Schuttig & Co., 5005 Calvert Rd., College Park, Md.
Radio and wired remote-control equipment

Schweitzer Mfg. Co., Inc., E. O., 1002 Dundee Rd., Northbrook, Ill.
Electrical instruments

Scientific Apparatus Co., 4 Landscape Ave., Yonkers 5, N. Y.
Laboratory apparatus

Scientific Balance and Instrument Service, 2650 S. W. Temple, Salt Lake City 15, Utah
High precision laboratory analytical balances

Scientific Development Co., Box 795, State College, Pa.
Automatic control systems; distillation columns

Scientific Equipment Co., 3527 Lancaster Ave., Philadelphia 4, Pa.
Laboratory apparatus

Scientific Glass Apparatus Co., Inc., 100 Lakewood Terrace, Bloomfield, N. J.
Glass apparatus and interchangeable ground glass joints; spectrophotometers; pH meters; ovens

Scientific Instrument Co., 1041 Second St., Detroit 26, Mich.
Industrial & laboratory thermometers; hydrometers; special laboratory apparatus

Scientific Instrument Development Labs., 204 W. Court St. Paris, Illinois
Industrial and scientific instruments

Scope Instrument Corp., Scope Building, Mamaroneck, N. Y.

Scott, Inc., Hermon Hosmer, 385 Putnam Ave., Cambridge 39, Mass.
Electronic equipment for measurement, analysis and reproduction of sound, noise and vibration, including meters, analyzers, amplifiers, radio tuners and turntables

Scott Testers, Inc., 101 Blackstone St., Providence, R. I.
Testing machines

Scovill Mfg. Co., P. O. Box 1820, Waterbury 20, Conn.
Tube fittings

Scrayco Manufacturing Co., 201 Green Ave., Middlesex, N. J.
Level controls for bin and bulk materials

Scruggs Co., Loyd, P. O. Drawer 232, Festus, Missouri
Shaded pole, universal, precision, geared and capacitor-type motors

Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, Ill.
Indicating flow meters; pressure gages; thermometers

Sealectric Switch & Relay Corp., 6025 N. Keystone Ave., Chicago 30, Ill.
Snap acting switches; relays

Seals, Ltd., 1010 Mission St., South Pasadena, Calif.
Glass insulated electrical connectors

Sealtron Corp., Reading Rd. at Amity, Cincinnati 15, Ohio
Glass-to-metal hermetic seals

Seamlex Co., Inc., 41-33 24th St., Long Island City 1, N. Y.

Sebrell Corp., J. B., 300 S. Los Angeles St., Los Angeles 13, Calif.

Secon Metals Corp., 7 Intervale St., White Plains, N. Y.

Security Controls, Inc., 257 Franklin St., Buffalo 2, N. Y.
Machine safety and control equipment

Security Valve Corp., 541 W. Garfield Ave., Glendale 4, Calif.
Valves for high, low or differential pressure, electric or automatic shut-off; for chemical, oil or gas per API and ASME specs
(See advertisement on page 232)

Seedburo Equipment Co., 618 W. Jackson Blvd., Chicago 6, Ill.
Moisture-testers; ovens; scales; thermometers

Seederer-Kohlbusch, Inc., 25 S. Van Brunt St., Englewood, N. J.
Analytical balances and weights; spring dynamometers

Seegers Manufacturing Co., 2600 Fletcher St., Chicago 18, Ill.
Gauge components including gauge movements, hairsprings, Bourdon tubes, links, etc.
(See advertisement on page 170)

Seely Instrument Co., 377 Fourth St., Niagara Falls, N. Y.
Interval timers; temperature and pressure pilots

Seismograph Service Corp., P. O. Box 1590-D, Tulsa 1, Okla.
Geophysical instruments

Selas Corp. of America, Dresher, Pa.
Pressure, flow and combustion controllers; instrument-air dehydrators; rotameters; laboratory micro-filters

Sell Electric Co., H. H., 3240 Dakota Ave., Minneapolis 16, Minn.
Phase sequence indicators

Semimetals, Inc., 15 E. 48th St., New York 17, N. Y.
Silicon crystal growing and refining equipment; single-crystal germanium, N-type or P-type for diode and transistor applications

Sendur Mfg. Co., 3225 N. Sheffield St., Chicago 13, Ill.
Electrical instruments

Sensitive Research Instrument Corp., 310 Main St., New Rochelle, N. Y.
Electrical instruments measuring quantities or values of small current or voltage

Sequoia Process Corp., 871 Williow St., P. O. Box 1007, Redwood City, Calif.
Electrical and electronic components

Sequoia Wire, 2201 Bay Rd., Redwood City, Calif.
Electronic hook-up wire and cables; shielded constructions, specialty cables; standard insulations, and Teflon and Hyrad irradiated insulation

Seraphin Test Measure Co., 1314 North 7th St., Philadelphia 22, Pa.

Serdex, Inc., 91 Cambridge St., Boston 14, Mass.
Humidity indicators, recorders and controllers

Service Recorder Co., 1375 Euclid Ave., Cleveland 15, Ohio
Vehicle recorders; fuel consumption meters

Servo Corp. of America, 2020 Jericho Pike, New Hyde Park, N. Y.
Electronic equipment for automation; servomechanisms; analog and digital computers; infrared detection systems

Servomechanisms Inc., 625 Main St., Westbury, L. I., N. Y.
Computers; amplifiers; servomotors

Servomechanisms, Inc., Mechanical Components Div., 100 El Segundo Blvd., Hawthorne, Calif.

Servonic Instruments, Inc., 1145 S. Fair Oaks Ave., Pasadena 2, Calif.
Wire-wound potentiometer-type transducers (translation potentiometers, pressure pickups, slip rings, specially designed switches for guided missiles)
(See advertisement on page 164)

Servonics, Inc., 834 N. Henry St., Alexandria, Va.
Potentiometers; electromechanical integrators; magnetic amplifiers

Servospeed Div., Electro Devices, Inc., 4 Godwin Ave., Paterson 1, N. J.
Electronic motor speed control systems for variable speed by manual selection or by automatic control as process or variable function
(See advertisement on page 23)

Servo-Tek Products Co., Inc., 1086 Goffee Rd., Hawthorne, N. J.
Motion, position and speed recorders

Servotrol Co., Framingham Centre, Mass.
Voltage-dividing resistors

Sessions Clock Co., Box C, Forestville, Conn.
Timepieces and automatic timers

Seth Thomas Clocks, Div., General Time Corp., 135 S. Main St., Thomaston, Conn.
Household clocks; outdoor and tower clocks; clock movements for industrial purposes; electric timers

Severance Tool Industries, Inc., 754 Iowa Rd., Saginaw, Mich.

Shakeproof Div., Illinois Tool Works, St. Charles Rd., Elgin, Ill.
Specialized fasteners

Shallcross Controls, Inc., 2217 N. 31st St., Milwaukee 8, Wis.
Electric combustion, draft, and process control equipment

Shallcross Manufacturing Co., 10 Jackson Ave., Collingdale, Penna.
Wirewound and power resistors; switches; delay lines; attenuators; communications test sets; high voltage measuring equipment

Shand & Jurs Co., 8th & Carlton St., Berkeley 10, Calif.
Remote reading tank gages; telemetering and remote function control systems

Shasta Div., Beckman Insts., Inc., P. O. Box 296 Sta. A, Richmond, Calif.
VTVMs; power supplies; oscillators; voltmeters, frequency meters

Shawmut Engrg. Co., 195 Freeport St., Boston 22, Mass.
Abrasion testers

Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Pneumatic, electric, electronic, and mechanical gages and measuring instruments; machine tools

Sheip Mfg. Co., Henry H., 6th & Columbia Ave., Philadelphia 22, Pa.

Shelby Instrument Co., 321 West 7 St., Long Beach 2, Calif.
Electrical instruments

Sheldon & Co., E. H., Muskegon 82, Mich.
Laboratory furniture

Sheldon Machine Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill.
Instruments lathes and milling machines

Shepard Labs., 480 Morris Ave., Summit, N. J.
Automatic exposure controllers; relays; ordnance instruments

Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y.
Electrical testing equipment

Sherwin-Williams Co., 101 Prospect Ave., N. W., Cleveland 1, Ohio

Shielding, Inc., Riverside Park, N. J.
Radio noise filters

Shore Instrument & Mfg. Co., 90-35 Van Wyck Expressway, Jamaica 35, N. Y.
Scleroscope hardness testers
(See advertisement on page 124)

Shunk Mfg. Co., Bucyrus, Ohio

Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill.
Microphones

Shurite Meters, 61 Hamilton St., New Haven 8, Conn.
Electrical panel and portable instruments
(See advertisement on page 64)

Sibley Co., Haddam, Conn.
Printed circuits; commutation discs; silver, gold, nickel, rhodium, palladium, tin plating; technical precision plating; plating on non-conductors for rotors, slip-rings, etc.
(See advertisement on page 79)

Sickles & Sons, Inc., 904 Chestnut St., Philadelphia 7, Pa.

Sickles Div., F. W., General Instrument Corp., P. O. Box 330, Chicopee, Mass.
Coils and tuning mechanisms for radio, television and military applications

Siemens-New York, Inc., 350 Fifth Ave., New York 1, N. Y.

Sierra Electronic Corp., 1050 Brittan Ave., San Carlos, Calif.
Carrier frequency voltmeters; wave analyzers; linefault analyzers; custom radio transmitters; vhf-uhf detectors; calorimeters; thermopiles; ionization gages; phase changers

Sierra Engineering Co., 123 E. Montecito Ave., Sierra Madre, Calif.
Miniature mechanical chain and sprockets

Sightmaster Corp., 111 Cedar St., New Rochelle, N. Y.
Microwave calorimeters; relays; welding rods

Sigma Instruments Inc., 170 Pearl St., South Braintree, Mass.
Relays

Signal Electric Mfg. Co., Menominee, Mich.
Fractional-hp motors

Signal Indicator Corp., 42 Stewart Ave., Brooklyn, N. Y.
Dial lights; edge lighting assemblies

Signal Transformer Co., 2518 Coney Island Ave., Brooklyn 23, N. Y.
Transformers

Sig-Trans., Inc., Haverhill Rd., Amesbury, Mass.

Silge & Kuhne, 16th & Carolina Sts., San Francisco 19, Calif.

Sillcocks-Miller Co., 10 W. Parker Ave., Maplewood, N. J.

Simmonds Aerocessories, Inc., 105 White Plains Rd., Tarrytown, N. Y.
Aeronautical and engineering accessories

Simonds Saw and Steel Co., Ohio St., Lockport, N. Y.
Permanent magnet materials; soft magnetic materials; high and low expansion alloys

Simplex Time Recorder Co., Sanborn St., P. O. Box 280, Gardner, Mass.
Time recorders; printing counters; time stamps; elapsed time indicators; productographs; master clocks; program systems

Simpson Electric Div., Amer. Gage & Machine Co., 5200 W. Kinzie St., Chicago 44, Ill.
Electronic test equipment; panel meters; test equipment for radio, TV, air conditioning, and refrigeration; meter relays; aviation instruments

Simpson Optical Mfg. Co., 3200 W. Carroll Ave., Chicago 24, Ill.
Lenses; prisms; optical flats and complete optical systems
(See advertisement on page 153)

Sinclair Collins Valve Co., 454 Morgan Ave., Akron 11, Ohio
Automatic controllers and control valves

Sipp-Eastwood Corp., 39 Keen St., Paterson, N. J.
Electrical and electronic instruments; transformers

Sittler Corp., 18 North Ada St., Chicago 7, Ill.
Bare, braided, and stranded copper bonding jumpers and cable assemblies; voltage and continuity testers

Size Control Company, Div. of American Gage & Machine Co., 2500 Washington Blvd., Chicago 12, Ill.
Precision inspection equipment; centerless lapping machines

Sjostrom Co., John E., 1711 N. Tenth St., Philadelphia 22, Pa.
Laboratory furniture

Skinner Electric Valve Div., Skinner Chuck Co., New Britain, Conn.
Solenoid valves

Skyway Precision Tool Co., 3217 Casitas Ave., Los Angeles 26, Calif.
Torque testers

Slater Electric & Mfg. Co., Inc., 37th Ave. & 56th St., Woodside 77, N. Y.
Valves; pressure snubbers; switches, wiring devices

Slaughter Co., Young & College Sts., Piqua, Ohio
High voltage and electrical leakage testing equipment

Slip Ring Co. of America, 12820 Venice Blvd., Los Angeles 66, Calif.
Aircraft Instruments; intervalometers; precious metal contacts telemetering systems, rf, radio remote control

Slocomb Co., J. T., 122 Naubuc Ave., Glastonbury, Conn.
Micrometer calipers

Small Motors, Inc., 2076 Elston Ave., Chicago 14, Ill.
Universal fractional-hp motors, dynamotors, shaded pole motors and generators

Smith Co., S. Morgan, York, Pa.
Electromechanical components

Smith Corp., A. O., 5743 Smithway, Los Angeles 22, Calif.
Gasoline and oil meters

Smith Inc., Herman H., 2326 Nostrand Ave., Brooklyn 10, N. Y.
Electromechanical components

Smith Metal Treatment Co., R. G., 245 South St., Newark 5, N. J.

Smith Products Corp., Graydon, 52 Commonwealth Ave., West Concord, Mass.

Smok-Trol Corp., Ossining, N. Y.

Snap-Tite, Inc., 201 Titusville Rd., Union City, Pa.
Quick connect-disconnect couplings for hydraulic and pneumatic fluid transfer lines

Sodemann Heat & Power Co., 1737 Macklind Ave., St. Louis 10, Mo.
Air conditioned moist cabinet

Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill.
Engineering test apparatus for soils, concrete and asphalt

Sola Electric Co., 4633 W. 16th St., Chicago 50, Ill.
Transformers; automatic voltage adjusters
(See advertisement on page 223)

Sonoflux Corp., Commerce Bldg., Houston, Texas
Non-destructive inspection and testing equipment

Soreng Products Corp., see Controls Co. of America

Sorensen & Co., Inc., 375 Fairchild Ave., Stamford, Conn.
Chokes; current regulators; voltage regulators; transformers

Sorvall, Ivan, P. O. Box 230, Pearl St., Norwalk, Conn.
Laboratory instruments

Sound Apparatus Co., Stirling, N. J.
Sound measuring equipment; graphic recorders

South Bend Lathe Works, 303 E. Madison St., South Bend 22, Ind.
Precision lathes

Southern Desk Co., Hickory, N. C.
Laboratory furniture

Southern Electronics Corp., 239 W. Orange Grove Ave., Burbank, Calif.
Precision capacitors including plastic film types
(See advertisement on page 3)

Southwestern Industrial Electronics Co., 2831 Post Oak Road, Houston 19, Texas
Geophysical instruments; industrial controls; electronic test instruments; flowmeters; computers; transformers; tape recorders

Sparling Meter Co., Box 3277, Terminal Annex, Los Angeles 54, Calif.
Main-line and irrigation water meters; recording instruments, and control equipment

Spartan Coach & Mfg. Co., 319 N. Albany Ave., Chicago 12, Ill.
Edge-lighted panels

Sparton Control Systems Div., Sparks-Withington Co., Jackson, Michigan
Control and supervisory telemetering devices and design

Spaulding Fibre Co., 310 Wheeler St., Tonawanda, N. Y.
Fibre and plastic rods, tubes and fabricated parts

Special Instruments Lab. Inc., 312 W. Vine Ave., Knoxville, Tenn.
Radioactivity and geophysical instruments

Special Screw Products Co., P. O. Box 391-11, Forbes Rd., Bedford, Ohio
High pressure, corrosion-resistant, flared tube fittings

Specialized Instruments Corp., 601 O'Neil Ave., Belmont, Calif.
Ultra-speed centrifuges

Specialties Inc., Skunks Misery Rd., Syosset, L. I., N. Y.
Computers; airborne instruments and cameras; air dehydrators

Specialty Battery Co., Div. of Ray-O-Vac, 212 East Washington Ave., Madison 3, Wis.
Dry batteries

Specialty Engineering and Mfg. Co., 108 E. Dedham St., Boston, Mass.
Bourdon tubes and associated assemblies

Specialty Screw Machine Products Co., Dillerville Rd., Lancaster, Pa.

Spectrol Electronics Div., Carrier Corp., 1704 S. Del Mar St., San Gabriel, Calif.
Electrical and electronic components

Speedometer Electric Co., 690 Van Ness Ave., San Francisco 2, Calif.
Survey footmeter

Speedway Manufacturing Co., 1834 S. 52nd Ave., Cicero 50, Ill.

Speer Carbon Co., St. Marys, Pa.
Resistors and coil forms

Speidel & Co., Inc., Chas. W., 614 Baltimore Ave., Fernwood, Pa.
Surveying instruments

Spellman Television Co., Inc., 3029 Webster Ave., Bronx 67, N. Y.
High-voltage specialties; power supplies
(See advertisement on page 67)

Spence Engineering Co., Inc., 53 Grant St., Walden, N. Y.
Regulating valves; desuperheaters; strainers

Spencer-Kennedy Labs., Inc., 1320 Soldiers Field Rd., Boston 35, Mass.
Electronic laboratory test equipment: wide band and chain pulse amplifiers; fast-rise pulse generators; square wave generators; variable electronic filters

Spencer Mfg. Co., S. M., 3 Cornhill St., Boston 8, Mass.

Spencer Thermostat Div., Metals & Controls Corp., Attleboro, Mass.
Overheat motor protectors; starting relays; circuit breakers; precision snap switches

Sperry Gyroscope Co., Inc., Great Neck, N. Y.
Aircraft and marine navigational instruments

Sperry Products, Inc., Shelter Rock Road, Danbury, Conn.
Special railway testers

Sperry-Sun Well Surveying Co., 3118 Blodgett Ave., P. O. Box 8008, Houston 4, Texas
Underground surveying instruments for oil wells

Sphinx American Co., 32-30 58th St., Woodside 2, L. I., N. Y.

Spicer Co., Walter, 2088 E. Villa St., Pasadena, Calif.
Precision resistors, wire-wound to specification

Spinco Div., Beckman Instruments, Inc., 601 O'Neil Ave., Belmont, Calif.
Instruments used in medical, scientific, and commercial research; and in clinical medicine

Sprague Electric Co., Marshall St., North Adams, Mass.
Electrical instruments; resistors; capacitors; and circuit components

Sprague Engineering Corp., Budlong Ave. at 135 St., Gardena, Calif.
Automatic shut-off valves; hydraulic, pneumatic and fuel system test equipment, high-pressure air-operated pumps, gages savers; high pressure specialties
(See advertisement on page 173)

Sprague Meter Co., 35 South Ave., Bridgeport 4, Conn.
Liquid meters

Sprengnether Instrument Co., Inc., W. F., 4567 Swan Ave., St. Louis 10, Mo.
Scientific instruments; magnetometers; seismographs
(See advertisement on page 194)

Spring Specialty Co., 23 N. 5th Ave., Maywood, Ill.
Scribers; magnets; springs

Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.
Switches; relays; pressure and vacuum controllers; control valves; motor starters

Square D Co., see also Kollsman Instr. Div.

Squires Co., C. E., E. 18502 Syracuse Ave., Cleveland 10, Ohio
Boiler room instrumentation

Stackpole Carbon Co., St. Marys, Pa.
Carbon division:
Carbon brushes; precious metal contacts; carbon metal molded products
Electronic division:
Fixed and variable composition resistors; powdered iron cores; molded ferrite cores; permanent magnet materials; slide switches; composition capacitors; iron coil forms

Standard Arcturus Corp., 54 Clark St., Newark, N. J.
Vacuum tubes

Standard Automation Products, Division of General Industries of Amer., 1738 Ridgeway Rd., Havertown, Pa.
Screw machine products; precision gears; instrument parts; powdered metal machine parts

Standard Cabinet Co., 56 Washington St., Carlstadt, N. J.
Test chambers: altitude, temperature, humidity
(See advertisement on page 104)

Standard Controls, Inc., 1130 Popular St., Seattle 44, Wash.
Electronic-hydraulic servo valves

Standard Dayton Corp., P. O. Box 1001, Dayton 1, Ohio
Fractional-hp motors

Standard Electric Time Co., 89 Logan St., Springfield 2, Mass.
Electric and electronic components, assemblies and systems for time control, communications, experimental power distribution and network analysis
(See advertisement on page 221)

Standard Electrical Products Co., 2240 E. 3rd St., Dayton 3, Ohio
Relays

Standard Electronic Research Corp., 2 East End Ave., New York 21, N. Y.
Electronic instruments; time and frequency standards

Standard Engineering & Machine Co., Inc., 3709 Capitol Trail, Marshalltown, Wilmington 8, Del.
Automatic-control system; valves

Standard Gage Co., Inc., 70 Parker Ave., Poughkeepsie, N. Y.
Gages for linear measurements

Standard Horse Nail Corp., Box 316, New Brighton, Pa.
Screw machine products

Standard Molding Corp., 1517 E. 3rd St., Dayton 1, Ohio

Standard Products, Inc., 650 East Gilbert, Wichita, Kansas

Standard Pressed Steel Co., Box 204, Jenkintown, Pa.
Screw machine products; shop equipment, including desks, shelving, etc.

Standard Science Supply Co., 1231-39 N. Honore St., Chicago 22, Ill.
Laboratory supplies

Standard Scientific Supply Corp., 808 Broadway, New York N. Y.
Laboratory supplies

Standard Thermometer, Inc., 952 Dorchester Ave., Boston 25, Mass.
Mechanical thermometers

Standard Tool & Machine Co., Woodland Rd., Pittsburgh 38, Pa.
Thermocouple assemblies

Standard Transformer Corp., 3580 Elston Ave., Chicago 18, Ill.
Transformers

Stanley Works, 195 Luke St., New Britain, Conn.

Stanut Manufacturing Co., Inc., 47-43 37th St., Long Island City 1, N. Y.
Coil winding equipment

Staplex Co., Air Sampler Div., 777 Fifth Ave., Brooklyn 22, N. Y.
High-volume air sampler for air pollution study and control

Star Compass Co., 110 Antwerp St., East Milton, Mass.
Compasses

Starr Corporation, 49 W. 19th St., New York 11, N. Y.

Starrett Co., L. S., Athol, Mass.
Precision tools; dial indicators; steel tapes

States Co., 19 New Park Ave., Hartford 6, Conn.
Electricity meter testers
(See advertisement on page 160)

Statham Development Corp., 12411 W. Olympic Blvd., Los Angeles 64, Calif.
Temperature test chambers; regulated power supplies for strain gages; phase meters; angular accelerometer calibration equipment (torsional pendulum, torsional shake table)
(See advertisement on page 106)

Statham Laboratories, Inc., 12401 W. Olympic Blvd., Los Angeles 64, Calif.
Transducers for the measurement of acceleration, pressure, force and displacement

Statolet Corp., 65 61st St., Guttenberg, N. J.

Stator Electric Corp., 46-25 58th St., Woodside, L. I., N. Y.

Stavid Engineering, Inc., U. S. Highway #22, Plainfield, N. J.
Research, development, production; field of electronic-electromechanical guidance, control, radar, infrared, beacons, telemetering, automation; simulation; test equipment

Steatite Div., American Lava Corp., Cherokee Blvd. & Mfgrs. Rd., Chattanooga 5, Tenn.
Ceramic products; steatite and titania

Stebar Co., 217-28th Ave., Minneapolis 11, Minn.
Microscopes

Steel City Testing Machines, Inc., 8817 Lyndon Ave., Detroit 38, Mich.
Testing machines

Steel Co., Herman D., Lafayette Bldg., Philadelphia 6, Pa.

Stein Laboratories, Fred, 121 N. 4th St., Atchison, Kansas
Electronic moisture detectors

Steiner-Ives Co., Springfield Rd., Union, N. J.

Stepper Motors Corp., 11879 W. Florence Ave., Culver City, Calif.
Bi-directional dc step motors and precision digital positioners of pots, synchro, resolvers and switches

Sterling Engineering Co., Inc., 54 Mill St., Laconia 9, N. H.
Industrial measurement and control equipment

Sterling Inc., 3738 North Holton, Milwaukee 12, Wisc.
Motor operated valves

Sterling Mfg. Co., 7201 Wentworth St., Cleveland, Ohio
Battery testers and portable electrical instruments

Sterling Precision Corp., Instrument Div., 34-17 Lawrence St., Flushing 54, N. Y.
Electrical and electronic instrumentation

Sterling Transformer Corp., 297 N. 7th St., Brooklyn 11, N. Y.
Transformers; chokes

Stevens-Arnold Inc., 22 Elkins St., So. Boston 27, Mass.
Frequency, polarized and vibrating reed type relays; converters relays
(See advertisement on page 91)

Stevens Mfg. Co., Inc., P. O. Box 1007, Mansfield, Ohio
Thermostats

Stevens Walden, Inc., 459 Shrewsbury St., Worchester 4, Mass.

Stevenson Mfg. Co., 1205 Washington St., La Porte, Ind.

Steward Mfg. Co., W. D., 3600 Jerome Ave., Chattanooga, Tenn.

Stewart Corp., F. W. 4311-13 Ravenswood Ave., Chicago 13, Ill.
Remote control and power drive flexible shafting; dual drive adapters; right angle adapters and angle drives
(See advertisement on page 195)

Stewart Die Casting Corp., 4525 Fullerton Ave., Chicago 39, Ill.

Stewart Instrument Co., 6507 Grand River Ave., Detroit 8, Mich.
Productive time and energy analyzers

Stewart, M. C., Ashburnham, Mass.
Meteorological instruments

Stewart-Warner Corp., 1826 Diversey Parkway, Chicago 14, Ill.
Tachometers and pressure gages

Sticht Co., Inc., Herman H., 27 Park Pl., New York 7, N. Y.
Electrical instruments
(See advertisement on pages 101, 114, 199)

Still-Man Equipment Corp., 429 E. 164th St., New York 56, N. Y.

Stimpson Co., Inc., Edwin B., 70 Franklin Ave., Brooklyn 5, N. Y.

Stockdale Engineering Co., P. O. Box #144, Haddonfield, N. J.
Wynn diaphragm valves

Stocker & Yale, Inc., 77 Green St., Marblehead, Mass.
Optical instruments

Stoddart Aircraft Radio Co., Inc., 6644 Santa Monica Blvd., Hollywood 38, Cal.
Rf instruments; sound and noise analyzers; attenuators; broad band pulse generators

Stoelting, C. H. Co., 424 N. Homan Ave., Chicago 24, Ill.
Strip chart recorders, self balancing potentiometer type

Stokes Corp., F. J., 5500 Tabor Road, Philadelphia, Pa.
Special process machinery; pressure and vacuum gages; pellet presses; high vacuum pumps; McLeod vacuum gages; automatic water stills

Stokes Molded Products, Inc., 220 Webster St., Trenton 4, N. J.

Stone Paper Tube Co., 900-922 Franklin St., N. E., Washington 17, D. C.
Spiral laminated tubes of electrical papers and plastic films

Stortz, John L., 405 State St., Watertown, N. Y.
Industrial and laboratory mercurial thermometers

Stow Manufacturing Co., 353 Shear St., Binghamton, N. Y.
Flexible shafts

Straham Valves, Inc., 16 Hudson St., New York 13, N. Y.
Liquid-level gages; automatic valves

Stratex Instrument Co., 1861 Hillhurst Ave., Los Angeles 27, Calif.

Stratos, Div., Fairchild Engine & Airplane Corp., Bay Shore, L. I., New York

Streeter-Amet Company, 4101 Rovenswood, Chicago 13, Ill.
Automatic measuring, weighing and counting machines

Stromberg Time Corp., 135 S. Main St., Thomaston, Conn.
Timing devices and time clocks

Stronghold Screw Products, Inc., 1801 W. Winnemac, Chicago 40, Ill.

Struthers-Dunn, Inc., 150 N. 13 St., Philadelphia 7, Pa.
Relays; timing devices

Studebaker Hydraulic Products Co., 1733 N. 33rd Ave., Melrose Park, Ill.
Laboratory presses

Stupakoff Division of Carborundum Co., Latrobe, Pa.
Ceramic thermocouple insulators and protection tubes thermistors

Sturdy Tool & Gage Co., 14520 Schaefer Highway, Detroit 27, Mich.

Precision tools and dimensional gages; torque gages; pressure and vacuum gages

Sturtevant Co., P. A., Addison, Ill.
Torque measuring equipment
(See advertisement on page 246)

Stylograph Corp., 205 W. Main St., Rochester 4, N. Y.
Wax-coated recording paper; charts, stylus; teletyper paper for multiple copies; paper for copies without carbon
(See advertisement on page 78)

Suffolk Products Corp., Woodbine and Scudder Aves., Northport, L. I., N. Y.

Sullivan Varnish Co., 410 N. Hart St., Chicago 22, Ill.

Summerill Tubing Co., Bridgeport, Montg. Co., Pa.

Summers Gyroscope Co., 2328 Broadway, Santa Monica, Calif.
Automatic pilots, and gyro servos; gyroscopic flight indicating instruments

Sun Electric Corp., Harlem and Avondale, Chicago 31, Ill.
Electrical instruments and engine test equipment

Sun Radio & Electronics Company, 650—6th Ave., New York 11, N. Y.
Radio parts and test equipment distributor

Sunshine Scientific Instrument, 1810 Grant Ave., Philadelphia 15, Pa.
Electrical and electronic instrumentation

Sunstrand Machine Tool Co., Sunstrand Hydraulic Div., 2210 Harrison Ave., Rockford, Ill.

Super Cut Inc., 3418 N. Knox Ave., Chicago 41, Ill.

Superdraulic Corp., U. S. Truck Rt. 27, Somerset, Kentucky
Hydraulic pumps; cylinders; valves; and remote control equipment

Superex Electronics Corp., 4 Radford Place, Yonkers, N. Y.
Electronic components; plug-in circuits and components

Superior Air Products Co., 132 Malvern St., Newark 5, N. J.
Burettes

Superior Electric Co., 83 Laurel St., Bristol, Conn.
Variable transformers and voltage regulators

Superior Flux & Manufacturing Co., 1302 Ontario St., Cleveland 13, Ohio
Fluxes for welding, brazing and soldering

Superior Meter Co., Inc., 167 41st Street, Brooklyn 32, N. Y.
Gas meters and appliances

Superior Steatite & Ceramic Corp., 85 W. Forest Ave., Englewood, N. J.

Superior Tube Co., P. O. Box 191, Norristown, Pa.
Fine tubing

Supreme Inc., Greenwood, Miss.
Radio testing equipment; tube testers; set testers; analyzers; test oscillators; oscilloscopes; dynamic instruments

Surface Checking Gage Co., 5880 Hollywood Blvd., Hollywood 28, Calif.
Surface roughness standards and comparators

Surface Combustion Corp., 2375 Dorr Ave., Toledo 1, Ohio
Heat treat furnaces

Surface Finishes, Inc., 12 Official Rd., Addison, Ill.
Optical flats

Surprenant Manufacturing Co., 199 Washington St., Boston 8, Mass.
Plastic tubing and wire

Surty Mfg. Co., Inc., 4139 W. Kinzie St., Chicago 24, Ill.
Magnifiers

Suter, Alfred, 200 Fifth Ave., New York 10, N. Y.
Testing apparatus for textiles and metals

Suverkrop Instruments, Box 436, Bakersfield, Calif.
Drafting and surveying instruments

Swanson Engineering & Mfg. Co., 1133 E. Redondo Blvd., Inglewood 3, Calif.
Industrial control systems; prefabricated control centers; graphic and conventional panels

Swartwout Co., 18511 Euclid Ave., Cleveland 12, Ohio
Power plant and process control equipment
(See advertisement on page 24)

Swedish Gage Co. of America, 10641 Haggerty Ave., Dearborn 1, Mich.
Dimensional gages

Sweets Co., Martin, 114 S. 1st St., Louisville 2, Ky.
Special electric and electronic control and test equipment

Swieco, Inc., 1512 E. Lancaster, Fort Worth 3, Texas
Temperature indicators and controllers

Swift & Anderson Inc., 952 Dorchester Ave., Boston 25, Mass.

Swiss American Jewel Bearings Co., 32-30 58th St., Woodside, L. I., N. Y.
Jewel bearings
(See advertisement on page 129)

Swiss Jewel Co., Lafayette Bldg., Philadelphia 6, Pa.
Sapphire and ruby jewel bearings

Swissomatic Products, 1818 Stanford St., Santa Monica, Calif.
Precision instrument parts

Switchcraft, Inc., 1328-30 N. Halsted St., Chicago 22, Ill.
Plugs and jacks; adapters; switches; microphone and phono connectors; cable assemblies; audio mixers

Switzer Bros., Inc., 4732 St. Clair Ave., Cleveland 3, Ohio
Daylight and ultraviolet paints, printing inks, fabrics, etc.; ultraviolet light sources

Sylvania Electric Products, Inc., 1740 Broadway, New York 19, N. Y.
Electronic instruments

Sylvania Electric Products, Inc., Parts Division, 12 2nd Ave., Warren, Pa.
Wire products

Synchro-Start Products, Inc., 8151 N. Ridgeway Ave., Skokie, Ill.
Safety control sets with visual and audible alarms; speed sensitive switches; solenoids

Synthane Corp., Oaks, Pa.
Laminated plastic products

Synthetic Gems & Jewels, Inc., Notre Dame St., Westfield, Mass.

Syntron Co., Homer City, Pa.
Heating elements; rectifiers; test sieve shakers

System Analyzer Corp., 700 W. State St., Nokomis, Ill.
Analag computers; phase converters; synchronous motors

Systematics, Inc., 30 Hermosa Ave., Hermosa Beach, Calif.
Computers; punched tape-to-card converters; integrated data processing equipment

T

TAB (Technical Apparatus Builders), 111 Liberty St., New York 6, N. Y.
Power supplies; electrical and electronic components

Taber Instrument Corp., 111 Goundry St., North Tonawanda, N. Y.
Pressure instruments; telemetering systems; testers; penetration; paper and metal sheet stiffness; abrasion resistance of paints, electroplate, linoleum, leather textiles

Tablet & Ticket Co., 1019-1021 W. Adams St., Chicago 7, Ill.

Taft-Peirce Mfg. Co., 32 Mechanic Ave., Woonsocket, R. I.
Inspection and gaging equipment; surface grinders

Talboys Instrument Corp., 13 Ackerman Ave., Emerson, N. J.
Stirrers and accessories; special laboratory apparatus

Taller & Cooper, Inc., 75 Front St., Brooklyn 1, N. Y.
Wind tunnel instruments; panel boards

Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.
Pyrometers

Taper Micrometer Corp., 100 Grove St., Worcester, Mass.
Dimensional gaging equipment; taper gages

Tarc Electronics, Inc., 48 Urban Ave., Westbury, L. I., N. Y.

Taylor & Co., W. A., 7300 York Rd., Baltimore 4, Maryland
Equipment for pH and chlorine control, control of phosphates in boiler water and for water analysis

Taylor Dynamometer & Machine Co., 6411 River Parkway, Milwaukee 13, Wis.
Dynamometers; balancing machines

Taylor Electric, Inc., 15412 Dale St., Detroit 23, Mich.
Wiring duct

Taylor Forge & Pipe Works, Inc., P. O. Box 485, Chicago 90, Ill.
Orifice flanges

Taylor Instrument Cos., 95 Ames St., Rochester 1, N. Y.
Indicating, recording and controlling instruments for temperature, humidity, pressure, rate of flow, and liquid level

Taylor Pivot Co., 1836 W. Jefferson St., Springfield, Ill.
Instruments pivots
(See advertisement on page 285)

Taylor-Winfield Corp., 1052 Mahoning Ave., Warren, Ohio
Welding equipment

Technic, Inc., 39 Snow St., Providence 1, R. I.

Technical Apparatus Builders, 109 Liberty St., New York 6, N. Y.
(See advertisement on page 15)

Technical Appliance Corp., Sherburne, N. Y.
Antennas and allied equipment

Technical Associates, 140 W. Providencia Ave., Burbank, Calif.
Instruments for nuclear research including monitors; scalers; survey meters; lead shields; counters; Geiger and scintillation counters; film badge service
(See advertisement on page 179)

Technical Charts, Inc., 189 Van Rennselaer St., Buffalo 10, N. Y.
Circular, strip and rectangular charts; electro-sensitive charts; computer plotting paper
(See advertisement on page 77)

Technical Electronics Corp., 4060 Ince Blvd., Culver City, Calif.
Synchronous motors for tape recorders and similar precision equipment; system analyzers for comparison against a known standard; plug-in housings for electronic assemblies
(See advertisement on page 150)

Technical Instruments Co., 3732 Westheimer Rd., Houston 6, Texas
Geophysical instruments; galvanometers; cable testers; vibration pickups

Technical Measurement Corp., 140 State St., New Haven, Conn.
Electrical and electronic instrumentation

Technical Tool Corp., 1057 N. LaBrea Ave., Los Angeles 38, Calif.
Chronometric tachometers

Technical Paper Co., Inc., 2430 Linden Ave., E., Linden, N. J.
Conversion and development of technical papers for chart use in graphic recording instrument fields; slitting, printing by rotary process, punching, rerolling, etc.

Technical Products Co., 19 North Dunlap, Memphis 1, Tenn.
Laboratory supply house

Technical Products Co., 6670 Lexington Ave., Los Angeles 38, Calif.
Distributors of wave analyzers and graphic recording instruments

Technical Soldering Co., 845 El Centro St., South Pasadena, Calif.
Manufacture and metallize glass for instrument windows; design and manufacture glass to metal seals

Technicraft Laboratories, Inc., Thomaston-Waterbury Road, Thomaston, Conn.

Techniflex Corp., 55 Jersey Ave., Port Jervis, N. Y.
Level indicators and controllers; motor-operated valves, positioners, etc.

Technique Associates, Inc., 211 E. South St., Indianapolis 25, Ind.
Pyrometers and pyrometric testing equipment
(See advertisement on page 178)

Techniques Inc., 24 Fair St., Hackensack, N. J.
Printed circuits

Technitrol, Inc., Allegheny & Emerald Sts., Philadelphia, Pa.
Computers and their components

Techno Instrument Co., 6666 Lexington Ave., Los Angeles 38, Calif.
Electrical and electronic instruments

Technograph Printed Electronics, Inc., 185 Valley St., Tarrytown, N. Y.
Printed circuits; strain gages

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Both single and double end.
Our entire capacity and years of engineering experience and know-how is geared to produce one thing only—quality pivots at a *low price.*
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Springfield, Illinois
For more information circle **437** on inquiry card.

Technology Instr. Div., Acton Labs., 531 Main St., Acton, Mass.
Special audio equipment

Technomatic Instrument Co., 1733 S. Flower St., Glendale 1, Calif.
Large screen precision oscilloscopes; audio sweep generators

Techron Co., The, 254-256 Friend St., Boston 14, Mass.
Printed circuits

Teichert Engineering Co., 217-09 Merrick Blvd., Springfield Gardens, L. I., N. Y.
Glass engraving and blowing machinery

Tejax Engineering Corp., 180 Weeden St., P. O. Box 348, Pawtucket, R. I.
Dial indicating handwheels; valve position indicators; and V-port hand regulating valves

Tektronix, Inc., 9450 S.W. Barnes Rd., Portland, Ore.
Cathode-ray oscilloscopes and video test equipment

Telechrome, Inc., 88 Merrick Rd., Amityville, N. Y.
Photoelectric color comparators; Z-angle meters

Telechron Dept., General Electric Co., Ashland, Mass.
Instrument drives; fractional-hp motors

Telecomputing Corp., 12838 Saticoy St., North Hollywood, Calif.
Scientific film and oscillogram reading and recording equipment

Telecomputing Corp., Telecomputing Div., 12838 Saticoy Ave., No. Hollywood, Calif.
Automatic plotters; computers; counters; projectors

Tele-Dynamics Inc., 32nd & Walnut Sts., Philadelphia 4, Pa.
Telemetering systems

Teleflex, Inc., P. O. Box 69, North Wales, Pa.
Control shafts, linkages and cables

Telemeter Magnetics, Inc., 2245 Pontius Ave., Los Angeles 64, Calif.
Ferrite cores; data processing systems; input-output equipment; large-scale memory systems

Teletronics Laboratory Inc., 54 Kinkel St., Waterbury, L. I., N. Y.
Precision electronic test equipment for laboratory and production use

Televiso Corporation, 1415 Golf Road, Des Plaines, Ill.
Radio and electronic parts

Televiso Products Inc., 7466 Irving Park Rd., Chicago 34, Ill.
Electronic products; custom built equipment

Telewave Laboratories Inc., see Polarad Electronics Co.

Telex, Inc., E-A Div., Telex Park, St. Paul, Minn.
Decade boxes; slip rings

Tel-Instrument Electronics Corp., 728 Garden St., Carlstadt, N. J.

Tell-Tronics Products, Inc., P. O. Box 495, Memphis 1, Tenn.
Temperature controls, indicators and testers

Telonic Industries, 73 N. 2nd Ave., Beech Grove, Indiana

Tempel Manufacturing Co., 1939 Bryn Mawr Ave., Chicago 26, Ill.
Magnetic steel laminations

Temperature Engineering Corp., U. S. Highway #130, Riverton, N. J.
Temperature processing equipment and accessories for research, industry, communications and transportation

Tempil Corp., 132 W. 22 St., New York 11, N. Y.
Thermoscopic paint and thermometer sticks

Ten Bosch Inc., M., 80 Wheeler Ave., Pleasantville, N. Y.

Tennant Sons & Co., C., 100 Park Ave., New York 17, N. Y.

Tennessee Eastman Corp., Kingsport, Tenn.

Tenney Engineering, Inc., 1090 Springfield Rd., Union, N. J.
Design and manufacture of complete environmental test equipment; consultant for advanced requirements in missile and aircraft testing
(See advertisement on page 31)

Tensitron, Inc., Harvard, Mass.
Wire tension meters; rotating mercury pulse switch
(See advertisement on page 285)

Tensolite Insulated Wire Co., Inc., 198 Main St., Tarrytown, N. Y.

Teplitz, Henry H., 185 N. Wabash Ave., Chicago 1, Ill.
Audio frequency equipment; laboratory standard microphones

Testa Mfg. Co., 10130 East Rush St., El Monte, Calif.
Microscopes; borescopes; optical components; assemblies; sub-assemblies; optical engineering; optical and electrical military instruments; optical inspection and measuring instruments
(See advertisement on page 152)

Testing Equipment Co., 15 William St., New York 5, N. Y.
Instrument-shop tools and instruments

Testing Instruments, Inc., 242 Valley St., Dayton 4, Ohio
Electrical testing instruments for automotive equipment

Testing Machines, Inc., 123 W. 64 St., New York 23, N. Y.
Physical testing machines
(See advertisement on page 97)

Testrite Instrument Co., 135 Monroe St., Newark 5, N. J.
Scientific instruments

Texas Apparatus Co., 2300 Congress Ave., Houston 3, Texas
Control systems and panels

Texas Instruments Incorporated, 6000 Lemmon Ave., Dallas 9, Texas
Electrical and electronic instrumentation; optical parts and materials; transistors; magnetic and strip chart recorders; seismological instruments; recording oscillographs
(See advertisement on pages 35, 63, 226)

Thelen Co., 7850 Woodley Ave., Van Nuys, Calif.

Thermador Electrical Mfg. Co., 2000 So. Canfield Ave., Los Angeles 22, Cal.
Transformers and magnetic components for guided missiles and radar

Thermal American Fused Quartz, 18-20 Salem St., Dover, N. J.
Optical and insulating parts and materials

Thermal Syndicate Ltd., 18 Salem St., Dover, N. J.
Laboratory apparatus; optical flats; gas and vapor discharge tubes; light sources: mercury vapor and ultraviolet; optical parts

Thermco Laboratories, Johnson Rd., Michigan City, Ind.
Industrial instrumentation; gas-analysis equipment
(See advertisement on page 117)

Thermel Inc., 9400 W. Robinson Rd., Franklin Park, Ill.
Industrial, commercial and domestic electric heating units

Thermix Corp., Greenwich, Conn.
Aircraft controls; valves, pressure and float switches for aircraft

Thermo-Couple Products Co., 1515 N. 25th Ave., Melrose Park, Ill.
Thermocouples; thermocouple connectors and connector panels

Thermo Electric Co., Inc., Saddle River Township, Rochelle Park P. O., N. J.
Aircraft and industrial thermocouples, thermocouple wire and accessories; pyrometers, temperature controllers, indicators, recorders, monitoring systems, connector panels, resistance bulbs
(See advertisement on pages 178, 193, 205, 217)

Thermo Electric Manufacturing Co., 5112 Huff St., Dubuque, Iowa
Laboratory furnaces; automatic temperature controllers

Thermo-Products Co., Inc., 3470 N. Palmer St., Milwaukee 12, Wis.
Thermocouples, base and noble metals, standard and special assemblies; automatic thermocouple butt welders
(See advertisement on page 216)

Thermometer Corp. of America, 567 E. Pleasant St., Springfield, Ohio
Temperature indicators; compasses

Thermosen, Inc., 361 W. Main St., Stamford, Conn.
Vacuum tubes

Thomas Co., Arthur, H., West Washington Square, Philadelphia 5, Pa.
Dealers, retail-wholesale-export, in laboratory apparatus & reagents for laboratories of chemistry and biology

Thomas & Betts Co., Inc., 36 Butler St., Elizabeth, N. J.
Terminals and connectors; coaxial cable connectors

Thomas & Skinner, Inc., 1118 E. 23rd St., Indianapolis, Ind.
Permanent magnets; electrical transformer and motor laminations

Thomas Associates, 4607 Alger St., Los Angeles 39, Calif.
Brackets; wire harness clamps; bonding clamps; multiple support clamps; shims; tube clamps; etc.

CHECK ALL TENSIONS in
Wires, Yarns, Lastex
with the New SAXL
TENSION METER
Tensitron, Inc., Harvard, Mass.
For more information circle **438** on inquiry card.

Thomaston Tool & Die Co., Bridge St., Thomaston, Conn.

Thompson Co., A. J., Route 1, Box 812, Florissant, Mo.
Sub-miniature precision electro-magnetic clutches and brakes

Thompson Balance Co., 802 E. 18 Ave., Denver 5, Colo.
Fine balances and weights

Thompson Clock Co., H. C., 38 Federal St., Bristol, Conn.
Electric stop clocks and interval timers

Thompson Products, Inc., Electronics Div., 2196 Clarkwood, Cleveland 3, Ohio
Microwave instruments; coaxial switches; polar antenna recorders

Thomson Industries, Inc., 1029 Plandome Rd., Manhasset, N. Y.
Bushings; nylon bearings

Thordarson-Meissner Mfg. Div., Maguire Industries, Inc., 7th & Bellmont, Mt. Carmel, Ill.
Electrical and electronic instrumentation; components

Threadmiller Corp., 44 W. 44 St., New York 36, N. Y.

Three Point Industries, 3767 N. Racine Ave., Chicago 13, Ill.
Pipe gages

Thwing-Albert Instrument Co., 5323 Pulaski Ave., Philadelphia 44, Pa.
Pyrometers; papers testing instruments; portable pH meters; general testing instruments and machines

Tigerman Engineering Co., 4332 N. Western Ave., Chicago 18, Ill.
Alarm annunciator systems; switches; signals
(See advertisement on page 148)

Timely Instrument & Controls Co., 1645 W. 135th St., Gardena, Calif.
Magnetic servo amplifiers; miniature power type voltage references and supplies; voltage regulators

Times Facsimile Corp., 540 W. 58 St., New York 19, N. Y.
High speed recording and communications equipment; synchronous motors; audio frequency fork oscillators

Timetrol Co., 2919 Gladstone, Rockford, Ill.
Automatic timers

Tinker & Rasor, 203 Del Mar, San Gabriel, Calif.
Holiday detectors; pin hole detectors; oscilloscopes
(See advertisement on page 156)

Tinnerman Products Inc., 2038 Fulton Rd., Cleveland 13, Ohio

Tinsley Laboratories, Inc., 2526 Grove St., Berkeley 4, Calif.
Precision optics; optical instruments and accessories; optical designing and engineering
(See advertisement on page 155)

Ti-Pi Co., 1000 Broadway, Kansas City 6, Mo.
Thickness gages

Titan Metal Mfg. Co., Bellefonte, Pa.

Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.
Metal bellows

Tobe Deutschmann Corp., Norwood, Mass.
Electrical and electronic instruments and components

Todd Scientific Co., 160 N. State Rd., Springfield, Pa.
Laboratory fractionating equipment; spectroscopes; pressure and vacuum controllers and gages; vacuum pumps

Toledo Scale Co., 1079 Telegraph Rd., Toledo 12, Ohio
Automatic Scale for weighing, counting, check-weighing, compounding, force-measuring, weight-printing and weight-recording; and special devices for testing, classifying and standardizing

Topflight Tape Co., 160 E. 9th Ave., North York, Penna.
Printed pressure-sensitive tape for identification and labeling

Topp Industries, Inc., 5221 W. 102nd St., Los Angeles 45, Calif.
Aircraft and missile test instrumentation; optical instruments and components; automatic control systems

Tork Clock Co., Inc., 1 Grove St., Mt. Vernon, N. Y.
Clocks; timers; time controllers

Torrance Glass and Color Works, 22922 S. Normandie Ave., Torrance, Calif.
Glass products; metal to glass seals; high temperature furnaces

Torrington Co., 557 Field St., Torrington, Conn.
Small precision metal parts

Torsion Balance Co., Monhegan Ave., Clifton, N. J.
Weighing machines; balances; scales; weights

Torwico Electronics, Inc., 1090 Morris Ave., Union, N. J.
Magnetic amplifiers; chokes; transformers

Tracerlab, Inc., 130 High St., Boston 10, Mass.
Radioactivity detectors; continuous thickness gages; nucleonics instrumentation; isotopes

Tracktest Equipment Co., Box 499, Franklin 1, Mich.
Speed-time recorders; fifth-wheel speedometers; odometers

Trad Electronics Corp., 1001 First Ave., Asbury Park, N. J.
Attenuators; oscilloscopes; signal generators; closed-circuit TV projectors

Transformer Engineers, 325 N. Halstead St., Pasadena, Calif.
Transformers; reactors; wave filters; saturable core components

Transformers, Inc., 532 North St., Endicott, N. Y.
Transformers; magnetic amplifiers

Trans-Gel Products, Inc., 212-40 Jamaica Ave., Queens Village, N. Y.

Transicoil Corp., 107 Grand St., New York 13, N. Y.
Servo motors

Transistor Products, Inc., 241 Crescent St., Waltham 54, Mass.
Electronic components; photoelectric devices

Transitron Electronic Corp., 403-407 Main St., Melrose 76, Mass.

Transmag Div., California Magnetic Control Co., 11922 Valerio St., North Hollywood, Calif.

Trans-Sonics, Inc., P. O. Box 328, Lexington 73, Mass.
Pressure measurement and control systems and components; servo-mechanisms; electrical instruments

Transval Engineering Corp., 10401 W. Jefferson Blvd., Culver City, Calif.
Digital and analog computers; flight control equipment; communication and navigation equipment

Transvision, Inc., 460 North Ave., New Rochelle, N. Y.

Trans-Weigh Co., 114 S. Wayne Ave., Wayne, Pa.
Continuous weighing systems; gravimetric flow-rate meters

Trenton Transformer Corp., P. O. Box 568, Trenton, N. J.
Instrument, regulating, and testing transformers; magnetic components

Trerice Co., H. O., 1420 W. Lafayette Blvd., Detroit 16, Mich.
Thermometers; valves; pressure instruments

Tri-Dex Electronics, P. O. Box 1207, Lindsay, Calif.
Amplifiers; etched circuitry; special coils; terminal boards; wired electronic assemblies

Triad Corporation, 4515 Sepulveda Blvd., Sherman Oaks, Calif.
Motion picture cameras

Triad Transformer Corp., 4055 Redwood Ave., Venice, Calif.
Coils; toroids; filters; reactors; hermetically sealed terminals; audio transformers; power filaments; high and low frequency isolation

Trimount Instrument Company, 3119-21 W. Lake St., Chicago 12, Ill.
Manometers; well type, sliding scale U-tube, fixed scale U-tube, inclined, absolute pressure, and service; gages; draft and mercury pressure; indicating flow meters; tank level indicators
(See advertisement on page 143)

Triner Scale & Mfg. Co., 2714 W. 21st St., Chicago 8, Ill.
Scales and service

Trinity Equipment Corp., 472 Westfield Ave., East, Roselle Park, N. J.
Thermocouple wells; thermometer test wells; separable sockets for thermometers; drilled, welded and cast protecting tubes; stainless steel laboratory apparatus; special alloy machine products; deep hole drilling of alloy bars; API-ASME code alloy welding and fabrication

Trio Laboratories, 4025 Merrick Rd., Seaford, N. Y.
Electronic panel meters; miniature panel-mounting VTVM's; electronic frequency converters

Triplett Electrical Instrument Co., Harmon Avenue, Bluffton, Ohio
Electrical measuring instruments and radio testing equipment; instruments for laboratory and industrial test purposes; switches; relays; resistors; shunts

Triumph Mfg. Co., 1829 So. 55th Ave., Chicago 50, Ill.
Radio test instruments

Troemner, Henry, 911 Arch St., Philadelphia 7, Pa.
Balances

Truline Process Co., 2235 Chouteaut Ave., St. Louis 3, Mo.

Tru-Ohm Products Div., Model Engineering & Manufacturing, Inc., 2800 Milwaukee Ave., Chicago 18, Ill.
Wire wound vitreous enamel resistors; power rheostats

Tube Light Engineering Co., 427 W. 42nd St., New York 36, N. Y.
High vacuum pumps; spectroscopic light standards; parts for cold cathode fluorescent lighting equipment and neon signs.

Tube-Turns Plastics, Inc., 2929 Magazine St., Louisville 11, Ky.
Valves; pipe fittings; custom molded parts of polyvinyl chloride

Tung-Sol Electric Inc., 95 8th Ave., Newark 4, N. J.
TV and special-purpose electron tubes; semiconductor products; signal lamps

Tungsten Contact Mfg. Co., 7311 Cottage Ave., North Bergen, N. J.

Turner Electric Co., E. W., Box 6564, Philadelphia 38, Pa.
Thermowells

Tuttle & Co., W. H., Adrian, Mich.

U

U C Indicator Co., 624 E. Locust St., Milwaukee 2, Wis.
Liquid level gages

Uehling Instrument Co., 470 Getty Ave., Paterson 3, N. J.
Draft gages and recorders; liquid level gages and controllers; pressure and vacuum gages; recorders and controllers; manometers; barometers; gas analyzers
(See advertisement on page 296)

Uhrig Co., Joseph F., 4101-03 N. Fifth St., Philadelphia 40, Pa.
Scientific glassware

Ulanet Co., George, 413-15 Market St., Newark 5, N. J.
Thermostats; time delay relays; miniature heaters
(See advertisement on page 219)

Ultradyne Engineering Labs., Inc., 6109 Menaul Blvd. N. E., Albuquerque, N. Mex.
Electromechanical transducers

Ultrasonic Corp., 640 Memorial Dr., Cambridge 42, Mass.
Computers, accessories, components; data processing and remote control equipment; microwave and ultrasonic equipment; electronic instrumentation

Ultra-Violet Products, Inc., 5114 Walnut Grove Ave., San Gabriel, Calif.

Underwood Corp., 1 Park Ave., New York 16, N. Y.

Underwood Corp., Electronic Computer Div., 35-10 36th Ave., Long Island City 6, N. Y.
Digital computers; computers components; delay lines

Unertl Optical Co., John, 3551-3555 East St., Pittsburgh 14, Pa.
Optical instruments
(See advertisement on page 152)

Ungar Electric Tools Inc., 4101 Redwood Ave., Venice, Calif.
Electric soldering irons with interchangeable heating units and tiplets
(See advertisement on page 197)

Uniflow Valve Corp., 19 Quine St., Cranford, N. J.
Automatic control valves; valve positioners

Uniform Tubes, Level Road, Collegeville 2, Pa.
Precision tubes of all metals

Unimax Switch Div., W. L. Maxson Corp., Ives Rd., Wallingford, Conn.
Switches

Union Switch & Signal Div., Westinghouse Air Brake Co., Swissvale 18, Pa.
Industrial and aircraft instrumentation; relays and switchgear

Unistrut Products Co., 1013 W. Washington Blvd., Chicago 7, Ill.
Racks; fluorescent fixture supports

Unit Process Assemblies, Inc., 61 E. 4th St., New York 3, N. Y.
Thickness testers; periodic polarity reversers for plating application

United Carbon Products Co., Inc., 1300 N. Madison St., Bay City, Mich.
Laboratory apparatus and supplies

United-Carr Fastener Corp., 31 Ames St., Cambridge, Mass.

United Catalog Publishers, Inc., 110 Lafayette St., New York 13, N. Y.

United Control Corp., 4540 Union Bay Place, Seattle 5, Wash.
Temperature, level and position instrumentation

United Electric Co., Engrg. Div., 3938 W. Roosevelt Rd., Chicago 24, Ill.
Electrical indicating instruments

United Electric Controls Co., 85 School St., Watertown 72, Mass.
Temperature, pressure and vacuum controls

United Electronics Co., 42 Spring St., Newark 2, N. J.
Vacuum capacitors and vacuum tubes

United Engineers, Inc., 820 E. Sixth St., Tulsa, Okla.
Industrial measurement and control equipment; radioactivity instrumentation

United Instrument Co., 574 President St., Brooklyn 15, N. Y.
Pressure and temperature instrumentation
(See advertisement on page 218)

United Lens Co., 259 Worcester St. Southbridge, Mass.

United Mfg. Co. Div., W. L. Maxson Corp., 14 Haig St., Hamden 14, Conn.
Aircraft test equipment

United Optical Mfg. Corp., 202-4 E. 19th St., New York 3, N. Y.
Electrical measuring instruments

United Scientific Co., 204 Milk St., Boston 9, Mass.
Microscopes; camera microscopes; astronomical telescopes; meteorological instruments

United Screw & Bolt Corp., 2513 W. Cullerton, Chicago 8, Ill.

United States Blue Print Paper Co., 207 S. Wabash Ave., Chicago 4, Ill.
Surveying instruments

U. S. Components, Inc., 454 E. 148th St., New York 55, N. Y.
Connectors

U. S. Controls Co., 71 A St., Boston, Mass.

U. S. Electrical Motors, Inc., P. O. Box 2058, Terminal Annex, Los Angeles 54, Calif.
Speed control equipment; motors; generators

United States Electronics Development Corp., 275 Warren St., Lyndhurst, N. J.
Electrical filters, chokes and transformers; solenoids
(See advertisement on page 74)

U. S. Engineering Co., 5873 Rodeo Rd., Los Angeles 16, Calif.
Electronic hardware

U. S. Expansion Bolt Co., Standard Div., York, Pa.
Dimensional gages

U. S. Gasket Co., 600 N. 10th St., Camden 1, N. J.

United States Gauge Div., American Machine & Metals, Inc., Sellersville, Pa.
Indicating and recording pressure gages and thermometers
(See advertisement on page 171)

U. S. Gear Corp., 71, Broadway, Wakefield, Mass.
(See advertisement on page 119)

U. S. Indestructible Gasket Co., 829 E. 15th St., Brooklyn 30, N. Y.

United States Instrument Corp., P. O. Box 33, Charlottesville, Va.
Voice-powered telephone equipment

United States Radium Corp., 535 Pearl St., Morristown, N. J.
Screened, lithographed, etched, photo-reproduced instrument dials, panels, nameplates; edge lighted plastic panels; TV phosphors; radioactive products; X-ray screens

U. S. Relay Co., 1744 Albion St., Los Angeles 31, Calif.
Relays; solenoid contactors; packaged electronic systems

United States Rubber Co., 1230 Ave. of the Americans, New York 20, N. Y.

United States Testing Co., Inc., 1415 Park Ave., Hoboken, N. J.
Testing machines and instruments; accessory equipment

United States Time Corp., 500 Fifth Ave., New York 36, N. Y.
Gyroscopes

United Transformer Corp., 150 Varick St., New York 13, N. Y.
Transformers

Unitok Corp., 275 N. Halstead St., Pasadena 8, Calif.
Automatic welding machines

Unitronics, Inc., P. O. Box 191, Ferguson 21, Mo.
Light integrators; photoelectric controls

Universal Atomics Corp., 19 E. 48th St., New York 17, N. Y.
Transistorized circuits; systems; lightweight power supplies (up to 100,000 volts or 300 watts); radiation detection instruments for military, laboratory, medical, civilian defense and surveying use
(See advertisement on page 168)

Universal Aviation Equipment, Inc., 362 Fifth Ave., New York 1, N. Y.
Testing machines and instruments

Universal Blank Co., Inc., 79 North Rd., Southbridge, Mass.

Universal-Cyclops Steel Corp., Drawer 153, Bridgeville, Pa.

Universal Drafting Machine Co., 7960 Lorain Ave., Cleveland 2, Ohio
Drafting machines

Universal Electronics Co., 1720 22nd St., Santa Monica, Calif.
Dc regulated and unregulated power supplies, including electronically controlled supplies and magnetic-amplifier controlled supplies
(See advertisement on page 167)

Universal Engineering & Colorplate Co., Inc., 980 Elliott St., Buffalo 8, N. Y.

Universal Engraving & Color Plate Co., see Engineers Specialty Div.

Universal General Corp., 324 Canal St., New York, N. Y.
Supply house for relays, switches, and other electrical-electronic components
(See advertisement on page 184)

Universal Metal Hose Co., 2133 S. Kedzie Ave., Chicago 23, Ill.
Flexible metal hose products

Universal Scientific Co., Inc., 1102 Shelby St., Vincennes, Ind.
Transformers; electrical teaching aids

Universal X-Ray Products, Inc., 1140 Western Ave., Chicago 22, Ill.
X-ray transformers, controls and tubes; X-ray and fluoroscopic machines

Univis Lens Company, 401 Leo St., Dayton 1, Ohio
Optical flats; lenses; prisms

Urbana Engineering Prod. Div., Carl A. Bays & Assocs., Inc., P. O. Box 65, Urbana, Ill.

V

V & E Manufacturing Co., 758 S. Fair Oaks Ave., Pasadena 20, Calif.
Drafting machines; drafting room instruments

Vaco Products Co., 317 E. Ontario St., Chicago, Ill.
Instrument-shop tools; solderless terminals and terminal crimping tools

Vacutron, Inc., 2819 12th St., So., Arlington, Va.
Special vacuum tubes; electronic circuits and industrial control devices

Vacuum-Electronic Engg. Co., 86 Denton Ave., New Hyde Park, L. I., N. Y.
Leak detectors

Vacuum Research Co., 420 Market St., San Francisco 11, Calif.
Automatic-control valves; gaskets and seals

Vacuum Tube Products Co., Inc., 506 S. Cleveland St., Oceanside, Calif.
Vacuum gage tubes and controls; cathode-ray indicator and thyratron tubes; vacuum pumps

Valco, Inc., 1410 West St., Cincinnati 15, Ohio
Automatic valves

Valcor Engineering Corp., Carnegie Ave., Kenilworth, N. J.
(See advertisement on page 32)

Valley-National Corp., Clarke St., Milldale, Conn.

Vailorbs Jewel Co., P. O. Box 958, Lancaster, Pa.

Valor Electronics Components Co., 5808 Marilyn Ave., Culver City, Calif.
Miniature pulse transformers; magnetic shift register components; magnetic storage components

Valpey Crystal Corp., 1244 Highland St., Holliston, Mass.
Standard-frequency crystals; crystal-oscillator ovens

Valvair Corp., 454 Morgan Ave., Akron 11, Ohio
Control valves

Valve Pilot Corp., 230 Park Ave., New York 17, N. Y.
Locomotive speed and cut-off indicators and recorders

Valv-Trol Co., 573 Baird St., Akron 11, Ohio
Pressure controllers; control valves; accessories

Van Keuren Co., 176 Waltham St., Watertown, Mass.
Precision measuring tools and gages

Van Wagner Co., 89-04 113 St., Richmond Hill 18, N. Y.
Inspection devices

Vanguard Instrument Corp., 184 Casper St., Valley Stream, L. I., N. Y.
Oscilloscopes; photogrammetric instruments

Vanton Pump & Equipment Corp., Div. of Cooper Alloy Corp., 201 Sweetland Ave., Hillside 5, N. J.
Metering and proportioning pumps; plastic pipe and fittings; valves

Vapor Recovery Systems Co., 2820 N. Alameda St., Compton, Calif.
Liquid level gages, manometers, remote metering equipment; control valves

Varian Associates, 611 Hansen Way, Palo Alto, Calif.
Klystrons; nuclear resonance spectrometers; traveling-wave tubes; amplifiers; fluxmeters; electronic components

Vari-L Co., Inc., 432 Fairchild Ave., Stamford, Conn.
Variable inductors (saturable reactor type) for use in r-f and a-f sweep oscillators, frequency modulators, and afc systems
(See advertisement on page 126)

Varo Mfg. Co., 2201 Walnut St., Garland, Texas
Frequency standards; frequency meters; frequency power converters; communication equipment; regulated dc supplies

Vector Electronic Co., 3352 San Fernando Rd., Los Angeles 65, Calif.
Structures for electronic circuitry

Vectrol Engineering, Inc., P. O. Box 1089, Stamford, Conn.
Servo amplifiers; electrical control systems: phase shifters

Vectron Inc., Route 128, at Trapelo Road, Waltham 54, Mass.
Electronic and electromechanical equipment and instrumentation, including microwave spectrum analyzers, microwave test equipment, variable frequency ac power supplies, and precision components
(See advertisement on page 147)

Veeder-Root Inc., Hartford 2, Conn.
Mechanical and electrical counting and computing devices for military, civilian and special counting requirements
(See advertisement on page 44)

Ventrak Corporation, 11 W. 42nd St., New York

Versa Products Co., Inc., 249 Scholes St., Brooklyn 6, N. Y.
Motorized valves

Vibra Shock Corp., 5232 River Rd., Washington 16, D. C.
Vibration and acceleration instrumentation

Vibration Measurement Engineers, 7665 Sheridan Rd., Chicago 26, Ill.
Seismographs

Vibration Research Labs., Inc., 97 Lake Ave., Tuckahoe, N. Y.

Vibro-Ceramics Corp., 212 Durham Ave., Metuchen, N. J.

Vickers Electric Div., Vickers, Inc., 1815 Locust St., St. Louis 3, Mo.
Rectifiers and photoelectric cells

Vickers, Inc., 1400 Oakman Blvd., Detroit 32, Mich.
Pumps and valving devices for control of power in oil-hydraulic systems

Victor Animatograph Corp., Davenport, Iowa
Motion picture projectors; magnetic recording attachments for projectors, micro-projectors

Victor Laboratory, J. N., 701 Lechauweki Ave., Bethlehem, Pa.
Testing instrumentation; oscillographs; scientific cameras

Victoreen Instrument Co., 5806 Hough Ave., Cleveland 3, Ohio
Radiation and radioactivity detecting instruments

Victory Engineering Corp., 115 Springfield Rd., Union, N. J.
Analyzing; detecting and automatic control instruments; thermistors

Viking Copper Tube Co., 16700 St. Clair, Cleveland, Ohio
Air and hydraulic tubing

Viking Industries, Inc., 21343 Roscoe Blvd., Canoga Park, Calif.
Connectors and jacks: molded plastic products: servo amplifiers

Viking Instruments Inc., 9 Sylvan St. East, Haddam, Conn.
Tachometers, switches, remote control equipment

Vinco Corp., 9111 Schaefer Highway, Detroit 28, Mich.
Special gages

Virginia Electronics Co., River Road & B&O R.R., Washington 16, D. C.
Electrical and electronic instrumentation; soldering machines; communication equipment

Visco-Meter Corp., 315 Grote St., Buffalo 7, N. Y.
Viscosimeter

Vitramon, Inc., Box 544, Bridgeport, Conn.
Capacitors, high stability, low loss component, a laminent of porcelain and fine silver; completely insulated and with unitized lead electrode structure
(See advertisement on page 74)

Vocaline Co. of Am., Inc., Bristol Motor Div., 111 Coulter St., Old Saybrook, Conn.
Carrier communication systems; automatic-control systems; time and program controllers; relays and switches

Vogley & Lackman, 192½-196 Green St., New York, N. Y.

Voland & Sons, Inc., 32 Relyea Pl., New Rochelle, N. Y.
Analytical balances & weights Communication measuring instruments

Volkers & Schaffer Mfg. Corp., Box 996, Schenectady, N. Y.
Oscillographs and oscilloscopes; components

Vought Co., P. O. Box 1350, Beverly Hills, Calif.
Photographic equipment for aircraft use; high-speed cameras; pulse cameras; motion-picture cameras; designed to meet military standards

W

W-K-M Mfg. Co., Inc., 221 Roberts St., Houston, Texas

Wabash Insts. and Specialties Co., Box 194, Wabash, Indiana
Hydraulic presses; constant temperature tanks

Wabash Metal Products Co., 1569 Morris St., Wabash, Ind.
Laboratory presses, 3 to 50 tons; small metal stampings from aluminum, commercial bronze, phosphor bronze, and steel
(See advertisement on page 139)

WacLine, Inc., 35 So. St. Clair St., Dayton 2, Ohio
Adjustable speed ac drives; microwave components; electrical indicating instruments

Wade Tool Co., 49 River St., Waltham 54, Mass.

Wagner & Son, Carl H., 1944 N. Albany Ave., Chicago 47, Ill.
Thermometers

Wagner Co., Inc., Charles A., 4455 N. 6th St., Philadelphia 40, Pa.

Wakefield Industries, Inc., 5108 W. Grove St., Skokie, Ill.
Fractioning columns; pipettes, etc.

Wakmann Watch Co., Inc., 15 W. 47th St., New York 36, N. Y.
Stop watches and chronometers

Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, N. Y.
Retaining rings

Waldom Electronics, Inc., 4625 W. 53rd St., Chicago 32, Ill.
Instrument and electronic hardware

Walker & Co., Geo. T., 324 Fifth Ave., South, Minneapolis 15, Minn.
Laboratory supplies

Walker Div., Norma-Hoffman Bearings Corp., Hamilton Ave., Stamford, Conn.

Walker-Jamieson, Inc., 311 S. Western Ave., Chicago 12, Ill.
Radio and electronic components

Walkirt Co., 145 W. Hazel St., Inglewood 3, Calif.
Resin embedded plug-in circuitry for pulse field. Counters; multivibrators; pulse generators; square wave generators
(See advertisement on page 90)

Wall Colmonoy Corp., 19345 John R. St., Detroit 3, Mich.
Brazing and welding materials

Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J.
Chlorination equipment; chemical control equipment; gravimetric and volumetric dry chemical feeders; pressure sensitive instruments; marine aids to navigation
(See advertisement on page 142)

Walser Automatic Timer Corp., 420 Lexington Ave., New York 17, N. Y.
Timers

Waltham Horological Corp., 395 Lynnway, Lynn, Mass.
Rf coaxial cable connectors; telephone plugs and jacks

Waltham Precision Tool Co., 94 Walnut Hill Rd., Brookline, Mass.

Waltham Screw Co., 77 Rumford Ave., Waltham 54, Mass.

Wang Laboratories, 37 Hurley St., Cambridge 41, Mass.
Electronic computers; character-display signal generators; scalers; frequency meters

Ward Leonard Electric Co., 115 MacQuesten Parkway South, Mount Vernon, N. Y.
Resistors, rheostats; relays; motor starters, speed controllers; voltage regulators; electric control devices

Warebro Jewel Co., 59 Summit, Waltham 57, Mass.

Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio
Telescopes

Warner Electric Brake and Clutch Co., Beloit, Wisc.

Warren Engineering Co., Route 24, Broadway, N. J.
Regulating control valves

Warren-Knight Co., 136 N. 12th St., Philadelphia 7, Pa.
Surveying instruments and equipment

Warren Wire Co., Pownal, Vermont

Warrick Co., Charles F., 1964 West 11 Mile Rd., Berkley, Mich.
Relays and auxiliary equipment for liquid level controls
(See advertisement on page 133)

Warrick, Frederick P., Rt. No. 1, W. Long Lake Rd., Bloomfield Hts., Mich.
Scientific cameras

Water Leak Detector Co., 114 N. Third St., Columbus 15, Ohio
Water leak detectors

Water Level Controls Div., Healy-Ruff Co., 2255 University Ave., St. Paul 14, Minn.
Liquid level controls

Waterbury Companies, Inc., P. O. Box 1032, Waterbury 20, Conn.

Waterman Engineering Co., 721 Custer Ave., Evanston, Ill.
High pressure hydraulic valves; filters; check valves; solenoid valves; pressure compensated flow regulators

Waterman Products Co., Inc., 2445 Emerald St., Philadelphia 25, Pa.
Portable oscilloscopes; cathode-ray tubes
(See advertisement on page 11)

Waters Mfg. Inc., P. O. Box 368, South Sudbury, Mass.
Precision miniature wire-wound potentiometers

Watlow Electric Manufacturing Co., 1376 Ferguson Ave., St. Louis 14, Mo.

Watts Regulator Co., P. O. Box 810, Lawrence, Mass.
Pressure control valves for air, liquids, and steam; temperature regulators; air-line lubricators

Waugh Engineering Co., 7842 Burnet Ave., Van Nuys, Calif.
Turbine-type flow pickups (0.1 to 6000 gpm); electronic flow indicators and recorders; airborne fuel flow rate indicators and totalizers
(See advertisement on page 109)

Waukee Engineering Co., 5137 N. 25th St., Milwaukee 9, Wisc.
Flow-rate meters and automatic controllers

Waveforms, Inc., 333 Sixth Ave., New York 14, N. Y.
Oscillators; signal generators; electrical and electronic measuring instruments and testers

Waxon-Carboff, Inc., 8 Commercial St., Rochester 14, N. Y.
Wax coated recording chart paper, electrosensitive and spark
(See advertisement on page 77)

Weatherhead Co., Fort Wayne Div., 128 W. Washington Blvd., Ft. Wayne, Ind.
Pneumatic and hydraulic hose; cocks and fittings

Webber Gage Co., 12980 Triskett Rd., Cleveland 11, Ohio
Gage blocks

Webber Engineering Corp., P. O. Box 217, Indianapolis 6, Ind.
Environmental test cabinets, simulating high and low temperatures, including pressure and humidity; industrial freezers for shrink fitting and testing.

Weber Co., F., 1220 Buttonwood St., Philadelphia 23, Pa.
Drafting equipment and supplies

Weber Aircraft Corp., Electronics Div., 3050 N. California St., Burbank, Calif.
Computers; amplifiers; control systems; oscillographs; electronic systems

Weber Bros., Metal Works, 108 N. Jefferson St., Chicago 6, Ill.
Laboratory apparatus

Webster Instrument, Inc., 11301 Schaefer, Detroit 27, Mich.
Hardness testers, especially for non-ferrous alloys

Weckesser Co., 5701 N. Northwest Highway, Chicago 30, Ill.
Clips, strappings, etc.

Weiber Corp., 1379 E. Linden Ave., Linden, N. J.
Instrument panel boards, graphic and conventional types

Weighing Components, Inc., 64 Fulmore Rd., Hatboro, Pa.
Industrial scales

Weinschel Engineering Co., Inc., 1053 Metropolitan Ave., Kensington, Md.
Step attenuators; coaxial attenuator pads; coaxial terminations; bolometer preamplifiers; insertion loss test sets

Weiss & Son, Inc., Albert A., 261-263 Vanderbilt Ave., Brooklyn 5, N. Y.
Industrial thermometers, mercury-in-glass, indicating for pipe line, tank mounting and portable use; plastic encased dough thermometers
(See advertisement on page 218)

Weksler Thermometer Corp., 195 E. Merrick Rd. Freeport, L. I., N. Y.
Instruments for indicating and recording temperature, pressure, and humidity, including mercury-in-glass and filled capillary systems
(See advertisement on page 219)

Welch Allyn, Inc., Skaneateles, N. Y.
Inspection lights; illuminated medical diagnostic instruments; special miniature lamps

Welch Manufacturing Co., W. M., 1515 Sedgwick St., Chicago 10, Ill.
Electrical instruments, high vacuum pumps, for science laboratories; densitometers, balances, scales, stirrers supplies

Weldmatic Div., Unitek Corp., 380 N. Halstead, Pasadena, Calif.
Precision stored-energy spotwelders in portable, bench and console models for joining metals from 0.0003" to 0.095"

Weller Electric Corp., 601 Stone's Crossing Rd., Easton, Pa.
Soldering irons

West Coast Elec. Mfg. Corp., 233 W. 116th Place, Los Angeles 61, Calif.
Solenoids

West Coast Electronics Co., 5873 W. Jefferson Blvd., Los Angeles 16, Calif.

West & Dodge Thread Gauge Co., Inc., 6 Power House St., South Boston, Mass.
Screw thread gages

West Instrument Corp., 4363 W. Montrose Ave., Chicago 41, Ill.
Temperature controllers, indicators, recorders; accessory equipment

Westburg Mfg. Co., 144 S. Coombs St., Napa, Calif.
Speed indicators; auto and marine tachometers and service instruments

Western Brass Mills Div., Olin Industries, Inc., East Alton, Ill.

Western Gear Corp., Electro Products Div., Box 182, Lynwood, Calif.
Miniature rotary electrical equipment including motors up to 2 hp; converters; alternators; generators; fans and blowers

Western Lithograph Co., Westline Products Div., 600 E. 2nd St., Los Angeles 54, Calif.
Pipe and wire markers; marking tapes and fabrics

Western Radiation Lab., 1107 W. 24 St., Los Angeles 7, Calif.
Radioactivity detecting and measuring instruments; meg-megohmmeters; electron tubes

Western Rubber Co., 9th & Douglas Sts., Goshen, Ind.

Western Union Telegraph Co., 60 Hudson St., New York 13, N. Y.

Westinghouse Air Brake Co., Industrial Products Div., Wilmerding, Pa.
Pneumatic control equipment; force and positioning devices for aircraft use

Westinghouse Electric Corp., 3 Gateway Center, P. O. Box 2278, Pittsburgh 30, Pa.
Switchboard, panel and portable measuring instruments, aircraft instruments, recorders, industrial and radio test set equipment; electric and electronic instrumentation and automation devices

Westinghouse Electric Corp., Lamp Div., Bloomfield, N. J.

Westinghouse X-ray Co., Inc., 2519 Wilkins Ave., Baltimore 3, Md.
Industrial X-ray equipment

Westline Products Div., Western Lithograph Co., 600 E 2nd St., Los Angeles
Wire markers

Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.
Switchboard, panel and portable measuring instrument: industrial and radio test equipment; light measuring instruments and photographic exposure meters; dial type industrial temperature gages; control relays and aircraft instruments; indicating, recording and controlling instruments

Westport Electric Co., 149 Lomita St., El Segundo, Calif.
Electronic digital counting and frequency measuring instruments

Westronics, Inc., 3605 McCart, Fort Worth 10, Tex.
Special electronic electrical and electromechanical instruments; miniature recording potentiometer
(See advertisement on page 163)

Wheaton Co., R. W., 319 Mt. Pleasant Ave., Newark N. J.

Wheaton Co., T. C, Millville, N. J.
Glassware

Wheatstone Corp., Foster, Ky.
Thermocouples and pyrometer tubes

Wheelco Instrument Div., Barber-Colman Co., 1300 Rock St., Rockford, Ill.
Process control instrumentation

Wheeler Insulated Wire Co., Inc., 150 E. Aurora St., Waterbury 20, Conn.

Wheelock Signals, Inc., 273 Branchport Ave., Long Branch, N. J.

Whiddett Co., John C., No. 9 Union Ave., Bala-Cynwyrd, Pa.
Control systems

White Co., Inc., David, 315 W. Court St., Milwaukee 12, Wis.
Surveying instruments

White Dental Mfg. Co., S. S., 10 E. 40 St., New York 16, N. Y.

White Industrial Div., S. S., 10 E. 40th St., New York 16, N. Y.
Standard and special purpose resistors; temperature-responsive elements

White Instrument Laboratories, Box 9006, Allendale St., Austin 17, Texas
Filters; networks and amplifier-filters

White-Rodgers Electric Co., 1209 Cass Ave., St. Louis 6, Mo.
Furnace Controls

Whitehead Stamping Co., 1691 W. Lafayette Blvd., Detroit 16, Mich.

Whitey Tool & Die Co., 1150 55th St., Oakland, Calif.
Metering pumps; needle valves; accessories

Whitney Blake Co., New Haven 14, Conn.

Whittaker, Clark & Daniels, Inc., 260 W. Broadway, New York 13, N. Y.
Non-metallic minerals; colors and pigments; light chemicals

Whittaker Gryo Div., Telecomputing Corp., 16217 Lindbergh Ave., Van Nuys, Calif.
Designers and manufacturers of aircraft instruments and gyro devices

Whittington Pump & Engineering Corp., 1126 Prospect St., Indianapolis 3, Ind.
Testing machines; pressure instrumentation; vacuum pumps

Wiancko Engineering Co., 255 Halstead St., P.O. Box 78-E, Pasadena 8, Calif.
Pressure, force and acceleartion pickups; digital instrumentation; airborne carrier equipment; frequency modulated oscillators; complete instrumentation systems
(See advertisement on page 210)

Wickes Engrg. & Const. Co., 12th St. & Ferry Ave., Camden 4, N. J.
Supervisory control systems; electronic components; packaging

Wiegand Co., Edwin L., 7500 Thomas Blvd., Pittsburg 8, Pa.

Wiggins Oil Tool Co., E. B., 3424 E. Olympic Blvd., Los Angeles 23, Calif.

Wilcolator Co., 1001 Newark Ave., Elizabeth, N. J.
Thermostats

Wild Heerbrugg Insts., Inc., Main & Covert Sts., Port Washington, N. Y.
Optical and photographic instruments; surveying instruments; instrument-shop instruments

Wilder Inc., R. S., 26 Bedford St., Waltham 54, Mass.
Microprojectors; precision instrument parts

Wilder Mfg Co., Inc., Mechanic St. & Erie R.R., Port Jervis, N. Y.
Soldering iron holders

Wilkens-Anderson Co., 4525 W. Division St., Chicago 51, Ill.
Laboratory supplies

Wilkor Products, Inc., 2882 Detroit Ave., Cleveland 13, Ohio
Fixed and variable resistors; negative-temperature coefficient resistors

Will Corp., 39 Russell St., P. O. Box 1050, Rochester 3, N. Y.
Laboratory supplies and apparatus

Willey's Carbide Tool Co., 1340 W. Vernor Highway, Detroit 1, Mich.
Precision tools

Willams Apparatus Co., Inc., Herald Bldg., Watertown, N. Y.
Pulp and paper testing equipment and flue gas analysis apparatus

Williams Bros., Inc., 1125 W. Beardsley St., Elkhart, Ind.

Willams, Brown & Earle, Inc., 904-906 Chestnut St., Philadelphia 7, Pa.
Laboratory supplies

Williams Gauge Co., 1620 Pennsylvania Ave., Pittsburgh 12, Pa.
Water level gages

Williamson Development Co., 317 Main St., W. Concord, Mass.
Electrical and mechanical instrumentation

Willson Products, Inc., Reading, Pa.
Air conditioning and industrial hygiene instrumentation

Wilmad Glass Co., Inc., Frankline & Flower Sts., Landisville, N. Y.
Glass apparatus and components

Wilmar Mfg. Co., Inc., 1110 Truman Rd., Kansas City, Mo.
Electrical and electronic components

Wilmington Fibre Specialty Co., New Castle, Del.
Fibre products

Wilmotte, Inc., Raymond M., Box 397, Kendall Branch P. O., Miami, Fla.
Electronic gaging instruments

Wilson & Co., G. C., 1915 Eighth Ave., Huntington, W. Va.
Electronic control equipment; delay; interval, repeat cycle and program timing controls

Wilson Co., H. A., 2655 U. S. Route 22, Union, N. J.
Thermostatic bimetals

Wilson Mechanical Instrument Div., American Chain & Cable, 230 Park Ave., New York 17, N. Y.
Hardness testers

Win Sales Co., P. O. Box 257, Forest Hills 75, N. Y.
Instrument tweezers

Wincester Electronics, Inc., 15 Crescent St., Glenbrook, Conn.

Winchester Electronics, Inc., Willard Rd., Norwalk, Conn.
Connectors; plugs; clips; posts; jacks

Winn, Inc., J. H. 620 Washington St., Winchester, Mass.
Instrument pointers & dial hands; screw machine parts

Winslow Co., Inc., 9 Liberty St., Newark 5, N. J.
Ignition hardness test sets; aircraft engine instruments; thermocouples and instrument accessories; tachometers; vacuum gages; radio and telegraph keys; molded rubber cord sets, megohmeters, Wheatstone bridges

Winzeler Mfg. & Tool Co., 1712 W. Arcade Place, Chicago 12, Ill.
Precision gearing; dies; stampings

Wirt Co., 5221-27 Greene St., Philadelphia 44, Pa.

Wolfe Co., Franklin Co., 10567 Jefferson Blvd., Culver City, Calif.

Wolfe & Mann Mfg. Co., 28th & Sisson Sts., Baltimore 11, Md.
High and low voltage switchgear control and protection for generators and substations; bus runs; industrial controls; metal products; graphic panels; electronic chassis
(See advertisement on page 158)

Wolff Woodcraft Corp., Robert, 1125 Union Ave., Bronx 59, N. Y.

Wollensak Optical Co., 850 Hudson Ave., Rochester 21, N. Y.
Optical instruments

Wolverine Tube Div., Calumet & Hecla Consolidated Copper Co., 1850 Guardian Bldg., Detroit 26, Mich.

Wood Counter Lab, N., 5491 Blackstone Ave., Chicago 15, Ill.
Radiation detecting and measuring instruments

Woodruff & Stokes Co., Inc., 349 Lincoln St., Hingman, Mass.

Woods "Lab. Apparatus", F. W., 140-6 Warden St., Pittsburgh 20, Pa.
Biological laboratory supplies

Woods Hole Oceanographic Inst., Woods Hole, Mass.
Oceanographic instruments

Woodworth Co., N. A., 1300 East 9 Mile Rd., Detroit, Mich.
Gages for physical measurements

Worley Jewel Co., John, North Falmouth, Mass.
Sapphire and carbide bearings; orifices and wear parts in small sizes to close tolerances
(See advertisement on page 130)

Worner Electronic Devices, Rankin, Ill.
Photoelectric equipment

Worthington Corp., Harrison, N. J.
Liquid meters and instrument air compressors; pumps; motors; industrial mixers

Wroble Engineering Co., 1067 Davis Terrace, Schenectady 3, N. Y.
Universal testing machines

Wyland, George C., Center St., Ramsey, N. J.
X-ray tubes and cameras

Y

Yardney Electric Corp., 40-46 Leonard St., New York 13, N. Y.
Silver-zinc and silver-cadmium batteries

Yarnall-Waring Company, 102 E. Mermaid Lane, Chestnut Hill, Philadelphia 18, Pa.
Water columns; water gages and blow-off valves for steam boilers; spray nozzles for liquids; hydraulic valves for presses

Yellow Springs Instrument Co., Inc., P. O. Box 106, Yellow Springs, Ohio
Thermistor thermometers, temperature controllers; intercommunication amplifiers; interval timers

Yonkers Industries, Inc., 28 School St., Yonkers, N. Y.
Electronic instruments

Yonkers Lab. Supply Co., 70 Palisade Ave., Yonkers 5, N. Y.
Laboratory supplies

York Ice Machinery Corp., York, Pa.
High altitude test and calibration chambers

Young Bros. Co., 6511 Mack Ave., Detroit 7, Mich.

Youngberg Bros., 23 Cherry St., Meriden, Conn.

Z

Zeiss, Inc., Carl, 485 Fifth Ave., New York 17, N. Y.
Importers and distributors of microscopes, polarimeters, spectrophotometers, refractometers, micro-movie equipment, and scientific apparatus
(See advertisement on page 146)

Zenith Electric Co., Inc., 152 W. Walton St., Chicago 10, Ill.
Transfer, remote control, and automatic-time switches; interval, automatic reset, precess, and impulse timers; program clocks, reversing starters, and magnetic contactors

Zenith Optical Co., Huntington 19, W. Va.
Microscopes; lenses; optical flats

Zenith Optical Laboratory, 1940 Great Neck Rd., Copiague, L. I., N. Y.
Lenses; windows; flats; mirrors; prisms; sub-assemblies; high-vacuum coatings
(See advertisement on page 155)

Zenith Mfg. & Chem. Corp., 32 Beckman St., New York 38, N. Y.
Instrument cleaning machines and solutions

Zernickow Co., O., 15 Park Row, New York 38, N. Y.
High-accuracy tachometers for rotational, peripheral and surface speeds for plant and laboratory use
(See advertisement on page 209)

Zero Manufacturing Co., 1121 Chestnut St., Burbank, Calif.
Precision sheet metal work for electronics, aviation and guided missile components; instrument cases

Zoomar Corp., 55 Sea Cliff Ave., Glen Cove, N. Y.
Photometers; photomicrographic instruments; exposure meters

Zophar Mills, Inc., 112-130 26th St., Brooklyn 32, N. Y.

Handbook Data on Temperature and Pressure

By M. F. Behar

TEMPERATURE DATA

The following nine tables of data comprise an introduction to the field of Temperature Measurement and give reference data often needed by the instrument specialist.

Table 1—Rational Classification of Temperature Measurement Methods
Table 2—Industrial Classification of Temperature Measuring Instruments
Table 3—Principal Characteristics of Thermocouples
Table 4—Thermocouple Lead Wires
Table 5—Quick-Reference Data on Temperature Scales
Table 6—Classification of Visual Optical Pyrometers
Table 7—Quick-Reference Data on Resistance Elements
Table 8—Low-Temperature Visible-Column Thermometers
Table 16—(page 294) Characteristics of Filled-system or Pressure-spring Thermometers

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TABLE 1—RATIONAL CLASSIFICATION OF TEMPERATURE MEASUREMENT METHODS

I. Methods Utilizing Discontinuous Reversible Effects

1. *Freezing point.*
2. *Boiling point.*

← A line must be drawn (both meanings) between equilibrium temperature effects which include the International Standards, and all others.

3. *Molecular transformation point.*
4. *Solubility.*
5. *Color.*

Etc.

II. Methods Employing Continuous Effects

1. *Properties of bodies.*
   a. Thermal expansion, expansivity, expansibility.
      (1) of gases
      (2) of liquids
      (3) of solids
      Instruments are classified by utilized coefficient (linear, cubical); also as cathetometric, extensometric, volumetric, etc.
   b. Conductivity, resistivity (electrical).
      (1) of metals, of alloys.
      (2) of other solids.
      (3) of electrolytes.
      (4) of ionized gases, etc.
      Resistance measurement methods classifiable by type of circuit, by type of instrument (deflection, self-balancing, etc.) and in other ways.
   c. Viscosity, fluidity.
   d. Refractivity.
   e. Vapor pressure.
   f. Magnetic susceptibility.
   g. Sound velocity.
   h. Dielectric "constant."
   i. Elasticity.
   j. Rotatory polarization.
   k. Color of transmitted light.
   l. Color of reflected light.
   m. Hydrogen-ion concentration.
   n. Specific heat.
   o. Compressibility.
   Etc., etc., etc.
2. *Effects between bodies.*
   a. Simple differences of properties.
      (1) Expansivities.
         (a) Bimetallic.
      Etc.
   b. Effects at interfaces ("junctions," etc.).
      (1) Solid vs. solid.
      (2) Solid vs. liquid.
      (3) Liquid vs. liquid.
      Instruments classified also by utilization of effects, modes of conversion of energy: thermoelectricity, etc.
   c. Radiation effects.
      (1) Methods utilizing Stefan-Boltzmann fourth-power law.
      (2) Methods utilizing displacement of maximum energy density. (Color temperatures, of stars, etc.)
      (3) Methods utilizing selected band or effective wave-length.
         (a) Measurement of the monochromatic energy by visual matching.
         (b) Measurement by "extinction" methods, etc. etc.
         (c) Combinations of (a) and (b).
         (a) Selection by filtration as in use of red glass.
         (b) Selection by spectral curve of receiver: photocell, plate emulsion, etc.
      (4) Methods utilizing ratio of energy at two effective wave-lengths. ("Two-color pyrometry.") (a), (b), etc.: Further subdivision into visual and autometric; then by types of electrical ratio instruments, etc.
      (5) Spectroscopic, spectrographic or spectrometric methods.
      Etc.

III. Methods Utilizing Irreversible Effects

1. *Fusion.*
2. *Color change.*

Etc.

IV. Combination Methods

1. Methods using a temperature coefficient of an entire assembly. Examples: temperature coefficient of conductance of a thyratron; temperature coefficient of capacitance of a capacitor; temp. coeff. of rate of a clock; t.c. of pitch of almost any musical instr.
2. "Calorimetric pyrometers," "aspiration pyrometers" and other devices requiring transport or transfer or manipulation of the body or of a continuous sample.
3. Methods requiring the introduction of an "indicator" as in line-reversal method.

V. Miscellaneous Methods

(Miscellaneous in the sense of not includable in other divisions.)

TABLE 2 INDUSTRIAL CLASSIFICATION OF TEMPERATURE MEASURING INSTRUMENTS

I. Expansion Thermometers

1. *Liquid-in-glass* (*Visible-column*)
   a. Mercury—customary types
      (1) Industrial (complete protection)
      (2) Semi-industrial (incl. special-purpose)
      (3) Miscellaneous (pocket, wall, etc.)
      (4) Etched-stem ("laboratory," "chemical," "testing")
      (5) Enclosed-scale
   b. Mercury — special high-temperature glass
   c. Alcohol, toluol, pentane, etc.
   d. Gallium in quartz
2. *Solid expansion*
   a. Metal and refractory
   b. Bimetal
      (1) Integral: one element
      (2) Two metallic members
3. *Pressure-spring*
   a. Mercury
   b. Xylene, etc.
   c. Vapor-pressure
   d. Gas

II. Electrical Thermometers and Pyrometers

1. *Electrical Resistance*
   a. Platinum (standard)
   b. Nickel, copper, tungsten, etc.
   c. Semiconductors
2. *Thermoelectric*
   a. Rare-metals
   b. Special alloys
   c. C-SiC

III. Radiation Thermometers and Pyrometers

1. *Total-radiation*
   a. "Hand"
   b. Autometric, autographic, etc.
2. *Selective-radiation*
   a. Visual
      (1) Brightness
      (2) Color
   b. Autometric, autographic, etc.
      (1) Phototube receiver
      (2) Photocell receiver

IV. Miscellaneous

1. *Fusion* ("cones," etc.)
2. *Color Change* (of thermoscopic pastes, liquids or pellets).
3. *Solubility*
4. *Sound Velocity*
5. *Electrical "noise"*

TABLE 3—PRINCIPAL CHARACTERISTICS OF THERMOCOUPLES

Where two temperatures are given, higher is for thickest wires and lower is for thinnest wires commonly available. Degrees are FAHRENHEIT

Couples......	*Pt* *Pt-Rh*	*Copper* *Constantan*	*Iron* *Constantan*	*Chromel* *Alumel*	*Chromel X* *Copel*
Lowest temp. for satisfactory results (1)	32°	Approx. —400°	Approx. —400°	Approx. —400°	Approx. —400°
Highest temp. for good results; BARE couple in air	——	350° to 560°	600° to 1300°	1200° to 2000°	600° to 1000°
Highest temp. for good results; BARE couple in molten metals	——	——	600° to 1200°	1000° to 2000°	——
Highest continuous temp. for good results, usual protection (2)	2400° to 3000°	350° to 650°	700° to 1500°	1400° to 2200°	700° to 1100°
Reproducibility (3)	Excellent	Depends on 'constantan'	Depends on Sources	Excellent	Fair
Resistance to corrosion (normal use)	Perfect	Fair	Fair	Good	Good
Resistance to oxidation at highest temp.)	Perfect	Fair	Fair	Good	Good
Standard diameters of wires	B.S.gages 30 to 20	B.S.gages 36 to 2	B.S. gages 32 to 2	B.S. gages 30 to 2	B.S. gages 30 to 2
Especially useful for	Standards and precision work	Low temperature	——	Oxidizing atmospheres	
Not recommended for	Use with silica tubes	——	——	Reducing atmospheres	

(1) Thermocouple tip being measuring junction; and reference junction the hotter of the two.

(2) Temperature of the elements—not necessarily temperature to be controlled. See text.

(3) Reproducibility or interchangeability—Uniformity of electrical characteristics in order that successive purchases of wire will have same characteristics.

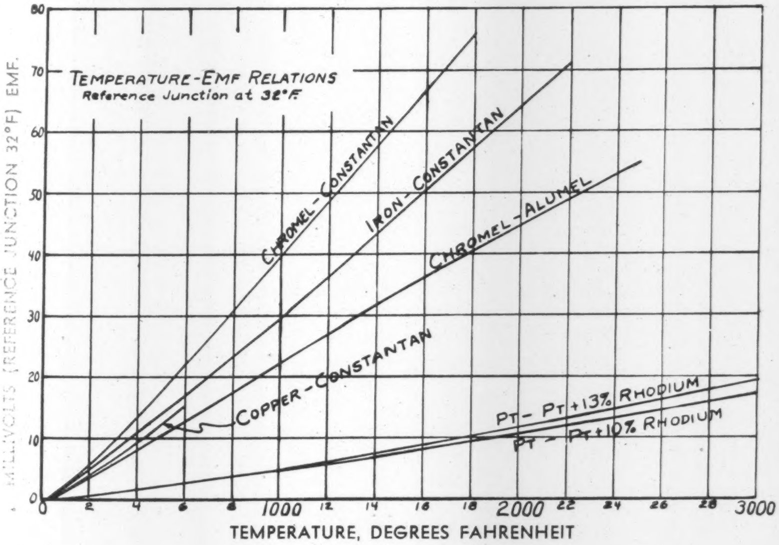


TABLE 4—THERMOCOUPLE LEAD WIRES

Thermocouple +	*Thermocouple* -	*Lead wire* +	*Lead wire* -
Copper	Constantan	Copper	Constantan
Iron	Constantan	Iron	Constantan
Chromel	Alumel	Chromel	Alumel
Chromel	Alumel	Iron	Copper-nickel alloy
Platinum-rhodium	Platinum	Copper	Copper-nickel alloy
Chromel	Alumel	Copper	Constantan (to 125 F.

TABLE 5—QUICK-REFERENCE DATA ON TEMPERATURE SCALES

	Steam Point	Ice Point	Abs. Zero
Celsius* (centigrade)	100.000	0.000	−273.16
Kelvin (abs. C.)	373.16	273.16	0.00
Fahrenheit	212.00	32.000	−459.69
Rankin (abs. F.)	671.69	491.69	0.00
Réamur	80.0	0.0	

*Standard name of scale by international agreement, 1948.

$$\text{Deg. C.} = \frac{5\ (\text{deg. F.} - 32)}{9}$$

$$\text{Deg. F.} = \frac{9\ (\text{deg. C.})}{5} + 32$$

but when converting temperature *differences* or *ranges* or *spans*:

9 F.deg. = 5 C.deg.
5 C.deg. = 9 F.deg.

and bear in mind the order of the numerics and letters, for the difference between 200 deg. F. and 150 deg. F. (for example) is not "50 degrees Fahrenheit" but "50 Fahrenheit degrees" (written 50 F.°).

TABLE 6—CLASSIFICATION OF VISUAL OPTICAL PYROMETERS

Division	*Class*	*Type*
Brightness	Photometer 1. Equality field 2. Contrast field 3. Flicker Etc. photometrically	Variable distance Variable diaphragm Absorbing wedge Rotating sector Rotating polarizer
	Disappearing-filament 1. Ammeter 2. Potentiometer Etc. electrically	Variable current Variable diaphragm Absorbing wedge Rotating sector
Color	Extinction of total luminous flux	"Gray" wedge
	Extinction of most-visible color	"Green" wedge
	Color ratio	Two colored wedges do. + absorbing wedge

TABLE 7—QUICK-REFERENCE DATA ON RESISTANCE ELEMENTS

Material	*Melting point (C.)*	*Usual range limits of commercial instruments* *Low* *C.*	*F.*	*High* *C.*	*F.*
Platinum	1773	−263	−442	545	1013
Tungsten	3380	not announced		300*	572*
Nickel	1455	−190	−310	310	590
Copper	1083	− 40	− 40	125	257
Semiconductors	(various)	−100	−148	400	752

*For first commercially-produced bulbs; will be raised considerably before the next edition of this Handbook is issued.

TABLE 8—LOW-TEMPERATURE VISIBLE-COLUMN THERMOMETERS

Liquid	*Customary limits of scale graduations* Lower C.	F.	Upper C.	F.
Alcohol	–60	–80	300	150
Tuluol	–95	–130	30	80
Pentane	–200	–330	30	80
"Pro-pro"	–220	–360	30	80

(Equal volumes of propane and propylene; C. Hochnadel, *RSI*, May 1954, p. 524)

PRESSURE DATA

Table 9—Temperature Corrections for Mercury Columns up to 32 Inches

Table 10—Correction of Mercury Columns to Standard Gravity, and Meniscus Correction

Table 11—Mean Coefficients of Cubical Expansion per Deg. Fahr. of Manometric Liquids

Table 12—Corrections for Barometers and Pressure Gages, in Inches of Mercury, for Decrease of Atmospheric Pressure per 100 Ft. Increase in Elevation

Table 13—Average Atmospheric Pressures at Various Altitudes

Table 14—Pressure-Measuring Instruments—Ranges of Applicability of the Classes and Types

Table 15—Pressure Unit Conversion Factors to 5 Significant Figures

Table 16—Characteristics of Classes of Pressure-Spring Thermometers

Table 17—Effect of Temperature on Water Columns

Table 18—Density of Water and Multipliers for Water Columns

Table 19—Quick-Reference Data on Pressure-Measuring Instruments

TABLE 9—TEMPERATURE CORRECTIONS FOR MERCURY COLUMNS UP TO 32 INCHES

Temp. of column, deg. fahr.	Observed reading of column in inches of mercury 16	18	20	22	24	26	28	30	32
				Add					
—20	0.07	0.08	0.09	0.10	0.11	0.11	0.12	0.13	0.14
—10	0.06	0.06	0.07	0.08	0.08	0.09	0.10	0.11	0.11
0	0.04	0.05	0.05	0.06	0.06	0.07	0.07	0.08	0.08
10	0.03	0.03	0.03	0.04	0.04	0.04	0.05	0.05	0.05
20	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Subtract					
35	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
40	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03
45	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.05
50	0.03	0.03	0.04	0.04	0.05	0.05	0.05	0.06	0.06
55	0.04	0.04	0.05	0.05	0.06	0.06	0.07	0.07	0.08
60	0.05	0.05	0.06	0.06	0.07	0.07	0.08	0.08	0.09
65	0.05	0.06	0.07	0.07	0.08	0.09	0.09	0.10	0.10
70	0.06	0.07	0.07	0.08	0.09	0.10	0.10	0.11	0.12
75	0.07	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.13
80	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15
85	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16
90	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.17	0.18
95	0.10	0.11	0.12	0.13	0.14	0.16	0.17	0.18	0.19
100	0.10	0.12	0.13	0.14	0.15	0.17	0.18	0.19	0.20

TABLE 10—CORRECTION OF MERCURY COLUMNS TO STANDARD GRAVITY AND MENISCUS CORRECTION

North latitude degrees	Elevation, feet: 0 Height of column, inches of mercury: 30	0 28	2000 28	2000 26	4000 26	4000 24	6000 24	6000 22
25	—0.05	—0.05	—0.05	—0.05	—0.05	—0.05	—0.06	—0.05
30	—0.04	—0.04	—0.04	—0.04	—0.05	—0.04	—0.05	—0.04
35	—0.03	—0.03	—0.03	—0.03	—0.03	—0.03	—0.04	—0.03
40	—0.02	—0.01	—0.02	—0.02	—0.02	—0.02	—0.03	—0.02
45	—0.00	—0.00	—0.01	—0.01	—0.01	—0.01	—0.01	—0.01
50	+0.01	+0.01	+0.01	+0.01	—0.00	—0.00	—0.00	—0.00

MERCURY MENISCUS OR CAPILLARITY CORRECTIONS

Not to be used with barometers, where the meniscus correction is allowed for in the setting of the scale. The correction is in inches and is to be added to the reading of a mercury column comprising a single leg and a reservoir of appreciable area. The table can be used also for a mercury U-tube with legs of different diameters. The reading is to be taken at the top of the meniscus.

Internal diameter inches	Height of meniscus in inches 0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08
			Correction in inches to be added					
0.15	0.024	0.047	0.069	0.092	0.116	...	...	...
0.20	0.011	0.022	0.033	0.045	0.059	0.078	...	...
0.25	0.006	0.012	0.019	0.028	0.037	0.047	0.059	...
0.30	0.004	0.008	0.013	0.018	0.023	0.029	0.035	0.042
0.35	...	0.005	0.008	0.012	0.015	0.018	0.022	0.026
0.40	...	0.004	0.006	0.008	0.010	0.012	0.014	0.016
0.45	...	...	0.003	0.005	0.007	0.008	0.010	0.012
0.50	...	...	0.002	0.004	0.005	0.006	0.006	0.007
0.55	...	...	0.001	0.002	0.003	0.004	0.005	0.005

TABLE 11—MEAN COEFFICIENTS OF CUBICAL EXPANSION PER DEG. FAHR. OF MANOMETRIC LIQUIDS

Liquid	*M.P.,F.*	*Sp. Gr.*	*Mean Coef.*
Water	32	1.0000	.000115
Mercury	− 38	13.570	.000101
Acetone	−138	0.792	.00162
Alcohol (ethyl).	−179	0.7939	.000600
Alcohol-glycol ..	− 60	1.0000	.000427
Benzene (benzol)	42	0.8794	.000687
n-Butyl Phthalate	− 31	1.0477	.000433
"Ellison Gage Oil"		0.8340	.000466
Ethylene Glycol.	0.8	1.1155	.000354
Glycerine (glycerol) ...	64	1.260	.000281
Kerosene	− 20	0.820	.000480

TABLE 12—CORRECTIONS FOR BAROMETERS AND PRESSURE GAGES, IN INCHES OF MERCURY FOR DECREASE OF ATMOSPHERIC PRESSURE PER 100 FT. INCREASE IN ELEVATION

Mean altitude, in feet	Mean atmospheric temperature, deg. fahr. −20	0	20	40	60	80	100
0	0.13	0.12	0.12	0.11	0.11	0.10	0.10
1000	0.12	0.12	0.11	0.11	0.10	0.10	0.10
2000	0.12	0.11	0.11	0.10	0.10	0.10	0.09
3000	0.11	0.11	0.10	0.10	0.10	0.09	0.09
4000	0.11	0.10	0.10	0.10	0.09	0.08	0.08
5000	0.10	0.10	0.10	0.09	0.09	0.08	0.08
6000	0.10	0.10	0.09	0.09	0.08	0.08	0.08
7000	0.10	0.09	0.09	0.09	0.08	0.08	0.08

TABLE 13—AVERAGE ATMOSPHERIC PRESSURE AT VARIOUS ALTITUDES

Altitude, above sea level feet	*Average atmospheric pressure,* Inches of Mercury at 32 deg. F.	Lb. per sq. in.
0	29.92	14.70
1,000	28.85	14.17
2,000	27.82	13.67
3,000	26.82	13.17
4,000	25.84	12.69
5,000	24.90	12.23
6,000	23.98	11.78
7,000	23.09	11.34
8,000	22.23	10.92
9,000	21.39	10.51
10,000	20.58	10.11
12,000	19.03	9.35
14,000	17.57	8.63
16,000	16.21	7.96
18,000	14.93	7.33
20,000	13.74	6.75

DEFINITIONS

Pressure is exactly defined as force applied to, or distributed over, a surface; and is measured as force per unit area.

Absolute Pressure is actual total pressure, acting on a surface. Whatever unit is used, the zero point is perfect vacuum.

Gage Pressure is that which is indicated by open-end liquid-column manometers and by Bourdon and other hollow-spring and diaphragm gages.

Static Pressure is the force per unit area exerted on a wall by adjacent fluid which is at rest or which is flowing parallel to the conduit wall, as at A in Fig. 1. Static pressure also exists in the midst of a body of fluid at a distance from a wall.

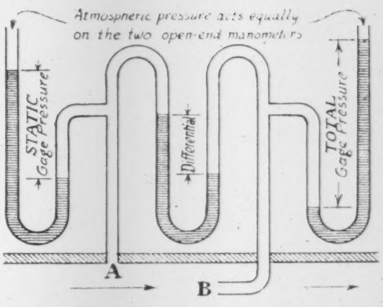

Atmospheric pressure acts equally on the two open-end manometers
STATIC Gage Pressure
Differential
TOTAL Gage Pressure
A
B

Fig. 1.

Total Pressure or Kinetic Pressure is the sum of the static and impact pressures, as at B in Fig. 1. It is greater than static pressure by an amount equivalent to the energy represented by the velocity of flow.

Impact Pressure or Velocity Pressure or Velocity Head is that due to the speed of flow.

Static and total pressures, as usually read, are gage pressures. However, the values used more often in engineering work—particularly when computation is involved—are Absolute Static Pressures or Absolute Total Pressures, obtained by adding algebraically the barometric pressure and the gage pressure readings.

Differential. Specifically, in fluid meter work, the differential head produced through a primary device installed for the purpose of flow measurement. See Fig. 1.

Head is defined as the height of a column or body of fluid above a given point considered as causing, counteracting or measuring pressure.

Hydrostatic Pressure is that due to head of liquid. Its value P at a distance h below the surface of a fluid of density d is hdg, g being the gravitational constant and the same system of units being used.

Vacuum. 1. The zero point of absolute pressure scales. 2. Negative pressure, below atmospheric; as "10 inches of vacuum."

Viscosity, in its various effects on pressure and in pressure instruments, may simply be defined as resistance to change of form.

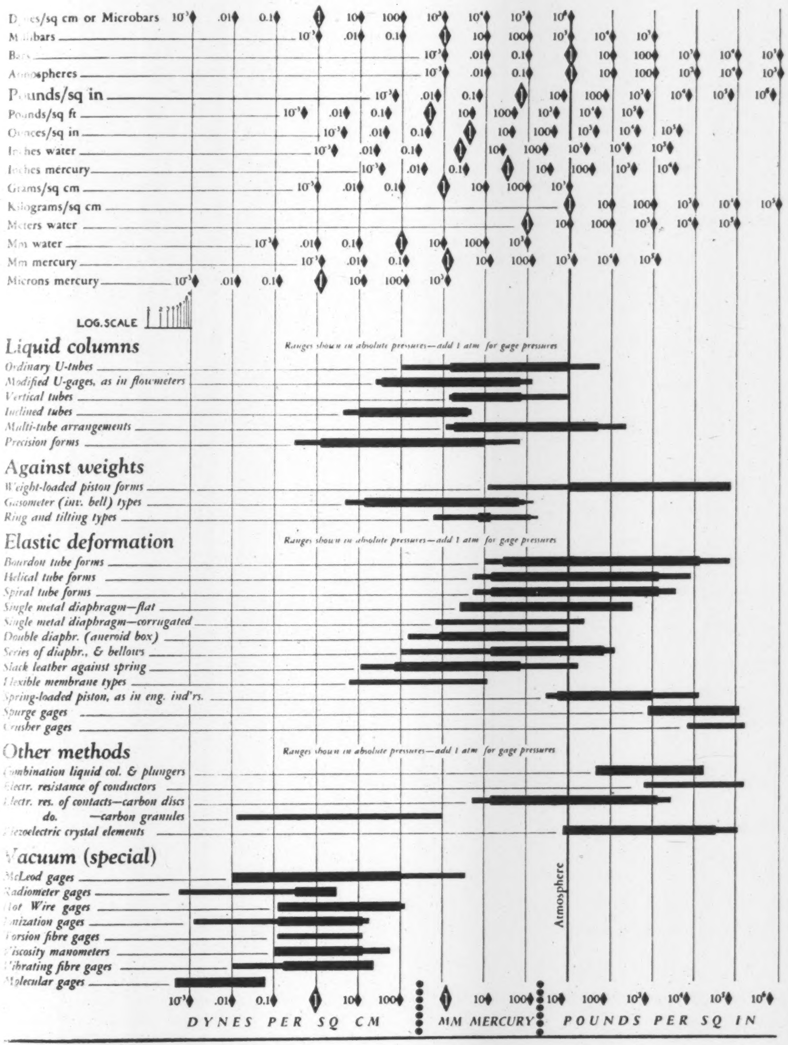
PRESSURE UNITS

Four systems of units are in use:
(1) Absolute units of force;
(2) Gravitational units of force;
(3) Linear units of liquid head;
(4) Atmospheres.

TABLE 14—PRESSURE-MEASURING INSTRUMENTS—RANGES OF APPLICABILITY OF THE CLASSES AND TYPES

and a Chart of Orders of Magnitude of Pressure Units

Notes—(1) Graphic pressure scale is logarithmic: each vertical line denotes ten times the value of the line at its left. (2) Scales of units extend only over pressures with which they are ordinarily used. (3) Ranges shown opposite types of instruments are those within which such types can be employed for measurement. Heavy portions indicate agreement of sources of information as to suitability. Lighter portions extend over pressures for which such suitability (or the availability of instruments) has been questioned.



This combination table and chart is the one originally published in 1930 as Table IX of "Pressure Measurement" by M. F. Behar. The changes in the names of some types, and the extensions of a few ranges, are summarized in Table 19.

TABLE 15—PRESSURE UNIT CONVERSION FACTORS to 5 significant figures.

		lb./in.^{2}	oz./in.^{2}	lb./ft.^{2}	ton/in.^{2}	ton/ft.^{2}	in.H$_2$O	ft.H$_2$O	in. Hg.	A$_n$	dyne/cm.^{2}	g/cm.^{2}	kg./cm.^{2}	cm. H$_2$O	m. H$_2$O	mm. Hg.	μ Hg.
ENGLISH	1 Pound /sq. in. =	*1.0000*	16.000	144.00	5.0000 x10^{-4}	7.2000 x10^{-2}	27.680	2.3067	2.0360	6.8045 x10^{-2}	68947.	70.306	7.0306 x10^{-2}	70.308	0.7031	51.715	51715.
	1 Ounce /sq. in. =	0.0625	*1.0000*	9.0000	3.1250 x10^{-5}	4.5000 x10^{-3}	1.7300	0.1442	0.1272	4.2528 x10^{-3}	4309.2	4.3941	4.3941 x10^{-3}	4.3942	4.3942 x10^{-2}	3.2322	3232.2
	1 Pound /sq. ft. =	6.9445 x10^{-3}	0.11111	*1.0000*	3.4723 x10^{-6}	5.0000 x10^{-4}	0.19223	1.6019 x10^{-2}	1.4139 x10^{-2}	4.7254 x10^{-4}	478.80	0.4882	4.8824 x10^{-4}	0.4882	4.8825 x10^{-3}	0.3591	359.13
	1 Ton /sq. in. =	2000.0	32000.	2.8800 x10^{5}	*1.0000*	144.00	55361.	4613.4	4072.0	136.09	1.3789 x10^{8}	1.4061 x10^{5}	140.61	1.4062 x10^{5}	1406.2	1.0343 x10^{5}	1.0343 x10^{8}
	1 Ton /sq. ft. =	13.889	222.22	2000.0	6.9445 x10^{-3}	*1.0000*	384.45	32.038	28.278	0.9451	9.5760 x10^{5}	976.48	0.9765	976.51	9.7651	718.26	7.1826 x10^{5}
	1 Inch water 39°F. =	3.6127 x10^{-2}	0.5780	5.2022	1.8063 x10^{-5}	2.6011 x10^{-3}	*1.0000*	8.3333 x10^{-2}	7.3554 x10^{-2}	2.4582 x10^{-3}	2490.8	2.5399	2.5399 x10^{-3}	2.5400	2.5400 x10^{-2}	1.8683	1868.3
	1 Foot water 39°F. =	0.43352	6.9363	62.427	2.1676 x10^{-4}	3.1213 x10^{-2}	12.000	*1.0000*	0.8826	2.9499 x10^{-2}	29890.	30.479	3.0479 x10^{-2}	30.480	0.3048	22.419	22419.
	1 In mercury 32°F. =	0.49116	7.8586	70.727	2.4558 x10^{-4}	3.5363 x10^{-2}	13.596	1.1330	*1.0000*	3.3421 x10^{-2}	33864.	34.532	3.4532 x10^{-2}	34.532	0.3453	25.400	25400.
INT'L	1 Normal Atm'ere =	14.696	235.14	2116.2	7.3480 x10^{-3}	1.0581	406.79	33.900	29.921	*1.0000*	1.0132 x10^{6}	1033.2	1.0332	1033.3	10.333	760.00	7.6000 x10^{5}
	1 Dyne/sq. cm. 1 Microbar =	1.4504 x10^{-5}	2.3206 x10^{-4}	2.0886 x10^{-3}	7.2519 x10^{-9}	1.0443 x10^{-6}	4.0147 x10^{-4}	3.3456 x10^{-5}	2.9530 x10^{-5}	9.8692 x10^{-7}	*1.0000*	1.0197 x10^{-3}	1.0197 x10^{-6}	1.0197 x10^{-3}	1.0197 x10^{-5}	7.5006 x10^{-4}	0.7501
METRIC	1 Gram /sq. cm. =	1.4224 x10^{-2}	0.2276	2.0482	7.1117 x10^{-6}	1.0241 x10^{-3}	0.3937	3.2809 x10^{-2}	2.8959 x10^{-2}	9.6784 x10^{-4}	980.66	*1.0000*	0.0010	1.00003	1.00003 x10^{-2}	0.7356	735.56
	1 Kilogram/sq. cm. =	14.224	227.58	2048.2	7.1117 x10^{-3}	1.0241	393.71	32.809	28.959	0.9678	9.8066 x10^{5}	1000.0	*1.0000*	1000.03	10.0003	735.56	7.3556 x10^{5}
	1 Cm. water at 4°C. =	1.4223 x10^{-2}	0.2276	2.0481	7.1115 x10^{-6}	1.0240 x10^{-3}	0.3937	3.2808 x10^{-2}	2.8958 x10^{-2}	9.6781 x10^{-4}	980.64	0.99997	9.9997 x10^{-4}	*1.0000*	0.0100	0.7355	735.54
	1 Meter water 4°C. =	1.4223	22.757	204.81	7.1116 x10^{-4}	0.1024	39.370	3.2808	2.8958	9.6781 x10^{-2}	98064.	99.997	9.9997 x10^{-2}	100.00	*1.0000*	73.554	73554.
	1 Mm. Hg. at 0°C. =	1.9337 x10^{-2}	0.3094	2.7845	9.6684 x10^{-6}	1.3922 x10^{-3}	0.53525	4.4605 x10^{-2}	3.9370 x10^{-2}	1.3158 x10^{-3}	1333.2	1.3595	1.3595 x10^{-3}	1.3595	1.3595 x10^{-2}	*1.0000*	1000.0
	1 Micron Hg. 0°C. =	1.9337 x10^{-5}	3.0939 x10^{-4}	2.7845 x10^{-3}	9.6684 x10^{-9}	1.3922 x10^{-6}	5.3525 x10^{-4}	4.4605 x10^{-5}	3.9370 x10^{-5}	1.3158 x10^{-6}	1.3332	1.3595 x10^{-3}	1.3595 x10^{-6}	1.3595 x10^{-3}	1.3595 x10^{-5}	0.0010	*1.0000*

TEMPERATURE *(Cont'd)*

TABLE 16—CHARACTERISTICS OF CLASSES OF FILLED-SYSTEM OR PRESSURE-SPRING THERMOMETERS

CLASS	LIQUID-FILLED		VAPOR-PRESSURE	GAS
	MERCURY	XYLENE		
Filling	Mercury under initial high spring pressure (Note 2)	Xylene (or other hydrocarbon) under initial pressure	Volatile Liquid (Note 8)	Inert gas under moderate initial pressure
Scale	Uniform	Fairly uniform (Note 5)	Progressive (Note 9)	Uniform
Bulb Volume	Medium, and varies inversely with length of range	Small	Medium (Note 10)	Large, and varies with *Tube* length
Minimum Bulb Length	3 to 5 inches	1 inch	2 inches	5 inches
Bulb Material	Steel or stainless steel	Stainless steel, brass, Monel, or nickel	Brass, Monel, steel, silicon bronze, etc.	Brass, Monel, steel, silicon bronze, etc.
Average 63% response time of average 7/16" diam. bulb (Note 1) with rapid circulation with slow circulation	in water 5 sec. 17 sec. in air 60 sec. 600 sec.	in water 6 sec. 20 sec. in air 75 sec. 750 sec.	in water 4 sec. 14 sec. in air 50 sec. 500 sec.	in water 7 sec. 22 sec. in air 85 sec. 850 sec.
Maximum Tube Length	25 feet (Note 3)	15 feet when uncompensated	250 feet (Note 10)	300 feet (Note 14)
Efects of temperature fluctuations along the capillary ("Tube error")	Vary with tube length and with area of capillary bore (Note 4)	Vary with tube length (Note 6)	None as long as bulb is hotter than tube (Note 11)	Vary with tube length and inversely with bulb volume (Note 15)
Can temperature fluctuations at spring be compensated	Yes	Yes	Compensation unnecessary (Note 11)	Yes
Effects of variations in atmospheric pressure (also "Altitude error")	Small (negligible in systems filled at high pressure)	Extremely small	Slight errors in lower end of range where actuating pressure is low	Slight errors at low working pressure only
Different level of bulb and instrument affects calibration.	Yes	Yes—slightly (Note 7)	Yes (Note 12)	No
Lower limits of ranges	-38°C. or -36°F.	-100°C. or -150°F.	-180°C. or -300°F. (Note 13)	-240°C. or -400°F.
Upper limits of ranges	540°C. or 1000°F.	400° C. or 750° F.	370°C. or 700°F.	540°C. or 1000°F.
Usual maximum commercial length of one span	550 C.° or 1000 F.°	330 C.° or 600 F.°	160 C.° or 250 F.° (Note 13)	550 C.° or 810 F.°
Usual minimum commercial length of one span	25 C.° or 45 F.°	22 C.° or 40 F.°	50 C.° or 90 F.° (Note 13)	50 C.° or 90 F.°

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NOTES

(*General Note*)—Table 16 had to be compiled, in part, from information released for the first time by various qualified sources. No two sources agreed on all points.

(1) For capillary bulbs, about 0.25 of the response-time L for a 7/16" bulb, plus a delayed start of about 0.1 L. All figures for L given here are rounded averages of widely different values, especially for air.

(2) Comparative advantages of the high-pressure mercury filling are ruggedness, durability and permanent accuracy. A slight disadvantage is limited choice of bulb material.

(3) 150 feet or more when "full compensation" is used. One method uses a gas-filled capillary alongside the mercury capillary, this body of gas actuating a second pressure-spring, shifting the mercury mechanism to compensate for temperature fluctuations along the tube. In another method, the capillary tube is of high-expansion material, and has running throughout its length a wire of low-expansion material, so that for a given change in temperature, the change in mercury volume is the same as that of the annular space it can occupy.

(4) No effects when "full compensation" is embodied in the system.

(5) Non-linearity above 250°F. is slight and it is said to be the same in successive shipments of xylene accepted for fillings; therefore, printed recorder charts may be used.

(6) Slight: Even with smallest standard bulb, effect of change from ice to steam on 10 ft. capillary is claimed to produce 1°F. error in indicating bulb temperature. Some makers supply "full compensation" systems.

(7) Lowest working pressure, at low end of usual ranges, is 300 psi.; 10 ft. head of xylene = 3.5 psi.

(8) Characteristics of many volatile liquids being known, makers can supply proper filling for each range specified. It always is advisable to specify not only the range but the *zone* within the range where accuracy is most needed. Reason: sensitivity increases with temperature.

(9) A "progressive" scale is "closed" at its lower end and "open" at its upper end.

(10) The capillary and spring for the usual ranges are completely filled with unvaporized liquid, with vapor generated only within the bulb. If bulb is excessively small or if tube is excessively long, cold ambient temperature (reducing volume of liquid in tube and spring) would leave insufficient liquid in bulb where there must always be a free surface.

(11) In the usual arrangement, when any portion of the tube *or spring* is subjected to a higher temperature than that of the bulb, the pressure of the higher temperature is developed as long as there is any liquid exposed to the hot spot.

(12) Considerably when working pressure differential is low. 10 ft. water head = 4.33 psi. Assuming a high Baume hydrocarbon, we get about 3.5 psi. for every 10 ft. Even more important is the total impairment of accuracy when bulb level is higher than spring and no liquid is left in bulb. Use of a transmission liquid sealed off from the active liquid by a bellows permits installing the bulb at a higher level than the spring.

(13) Liquids are chosen which will produce a vapor pressure sufficient to assure fair sensitivity at lower end of specified range. The upper end depends on liquid's critical temperature and pressure.

(14) Fluid friction in the capillary is negligible, the medium being a gas, and the length limitation is imposed by the temperature errors. In plants provided with room temperature control, longer tube lengths may be used. Some makers supply "full compensation."

(15) The largest practicable volume of gas should be contained within the bulb and therefore the longest length which the applications can take should be specified, even where maker can supply "full compensation."

TABLE 17—EFFECT OF TEMPERATURE ON WATER COLUMNS

°F	°C	*Density*	*Length of Column*
32	0	0.99987	1.00013
39	4	1.00000	1.00000
50	10	0.99973	1.00027
59	15	0.99913	1.00087
68	20	0.99823	1.00177
77	25	0.99707	1.00294
86	30	0.99567	1.00435
95	35	0.99406	1.00598
104	40	0.99224	1.00782
113	45	0.99025	1.00985

TABLE 18—DENSITY OF WATER AND MULTIPLIERS FOR WATER COLUMNS

		Multipliers for reducing readings in inches of water column to	
Temp. deg. F.	Density of water, lb. per cu. ft. *d*	Lb. per sq. in. (*d*/1728)	In mercury at 32 deg. F. (0.01178 *d*)
32	62.42	0.03614	0.07354
35	62.42	0.03614	0.07354
40	62.42	0.03614	0.07354
45	62.42	0.03614	0.07354
50	62.41	0.03613	0.07352
55	62.39	0.03611	0.07350
60	62.37	0.03609	0.07348
65	62.34	0.03607	0.07344
70	62.31	0.03606	0.07341
75	62.28	0.03604	0.07337
80	62.23	0.03601	0.07331
85	62.18	0.03598	0.07325
90	62.13	0.03595	0.07320
95	62.08	0.03592	0.07314
00	62.02	0.03589	0.07306

TABLE 19—QUICK-REFERENCE DATA ON PRESSURE-MEASURING INSTRUMENTS

CLASS	TYPE	CHARACTERISTICS		
		Optimum Range*	Accuracy†	Other Characteristics (Footnotes explain symbols)
U-Tube	Glass—mercury	0.5-50"Hg	0.02"	Ga Di *Co* **In** *Sd* **Sy Vb**
	Glass—water	0.5-100"H$_2$O	0.02"	Ga Di **In Sy** Vb
	Glass—two-liquid	0.01-1"H$_2$O	0.5%	Ga Di Dr **In Sy**
	Float, electric, etc.	0.5-50"Hg	0.05"	*Ga* Di Co Re RR Sy Vb
	Multiple-tube	10-100'Hg	0.5%	*Abs* Ga **In** Sd **Sy**
Single tube	Vertical—open top	2-100"Hg	0.02"	Ga **In Ru** Sv Vb
	Compression manom.	vac.-200 psi	1%	Abs *OV* **In** Sy
	Open-cistern vac. gage	0-30"Hg	0.02"	Abs OV **In** *Sd*
	Mercurial barometer	Atmospheric	0.01"	**In** *Sd*
	do., photocell servo	Atmospheric	0.005"	*Re* RR Sd **Sy**
	Abs. pressure gage	0-100"Hg.abs.	0.005"	Abs. OV **In** Sy
	Inclined-tube	0-4"H$_2$O	0.005"	Ga OV Dr **In Sy**
Micromanometer	Null method, etc.	0.001-20"H$_2$O	0.05%	Ga OV **In Sy**
Liquid col. & plunger	Mercury	50-5000 psi		Ga **In Ru**
Weight-loaded piston	Dead weight	-100,000 psi	0.1%	**Ga In** Ru Sd
	Fluid pressure scale	50-8000 psi	0.2%	**Ga In** Ru Sd
	Pendulum	100-8000 psi	0.2%	**Ga** *Co Sd*
	Automatic balance	200-1000 psi		**Ga** *Co* Re **RR**
Liquid-sealed bell	Oil sealed	0.1-10"H$_2$O	1%	Ga Dr *Di Co* Re Sy
	Mercury sealed	0.1-10"Hg	1%	Ga Dr *Di Co* Re **Sy**
Tilting	Ring, etc.	0.1-10"Hg	2%	Ga Dr Di Re RR **Sy**
Tube-spring	Single Bourdon	10-30000 psi	2%	Ga OV *Co Re* **Ru** Vb
	do., elec. trans.	10-3000 psi	2%	Ga OV Re **RR Ru** *Va Vb*
	do., pneu. trans.	10-3000 psi	2%	Ga OV Re **RR Ru** *Va Vb*
	do. "Inspector's"	10-5000 psi	0.5%	**Ga In** Sd
	Double Bourdon	50-800 psi	2%	**Ga Ru** Vb *Co*
	Helical	5-500 psi	1.5%	**Ga** *Co* Re *RR* **Ru**
	Spiral	10-1000 psi	1.5%	**Ga** *Co* Re **Ru**
Diaphragm (Metallic)	Unloaded, flat	1-200 psi	1.5%	Ga OV *Co* Re Ru ***Va Vb***
	Unloaded, corrugated	0.5-50 psi	2%	Ga OV Dr Co Re *Va*
	Spring-loaded	2-200 psi	1%	Ga OV *Co* Re Ru *Va*
	do., strain-ga. trans.	50-1500 psi	1%	Abs Ga OV Di **Os RR Vb**
	do., pneu. trans.	vac.-300 psi	0.5%	*Abs* Ga OV Dr **RR Va Vb**
Membrane (leather, fabric, plastic, etc.)	Spring-loaded	0.2-100"H$_2$O	1.5%	Ga Dr Di *Co* Re Sy
	do., elec. trans.	0.1-50"H$_2$O	1.5%	*Abs* Ga Dr *Di* Re **RR** *Va*
	do., pneu. trans.	0.1-40"H$_2$O	1.5%	Ga OV Dr *Di* Re **RR** *Va*
Bellows	Unloaded	1-100"H$_2$O	2%	Ga OV Dr Di Co Re *RR* Sy
	Spring-loaded	0.5-200 psi	2%	**Ga OV** Dr *Co* Re *RR*
	do., elec. trans.	0.5-50 psi	1%	**Abs Ga OV Di RR Va** *Vb*
	do., pneu. trans.	0.1-100 psi	1%	Abs Ga OV Di **RR** Va *Vb*
	Pendulum-loaded	10-200"H$_2$O	2%	Ga OV Dr *Co* Re Sy
Capsular spring	Unloaded	1-50"H$_2$O	3%	*Abs* Ga OV *Di* Ru *Va* Vb
	Aux. spr. loaded	0.5-100 psi	2%	*Abs* Ga OV *Di* Ru *Va*
	Null method	Atmospheric	0.1%	**In** Sd
	Aneroid barometer	Atmospheric	0.2%	Re *RR*
Electrical	Carbon pile, etc.	50-2000 psi	2%	**Ga Os** Re **RR** Ru **Vb**
	Crystals	100-20000 psi	2%	**Ga Os** Re **RR Vb**
	Electromagnetic	5-10000 psi	2%	Ga Re **RR** Ru Va
	Manganin, etc.	1000 atm.up	3%	**Ga Os** Re **RR Ru Vb**
VACUUM		MICRONS		
Liquid column (compression manom.)	Laboratory McLeod	0.01-2000	2%	**In** Sd **Sy**
	Industrial McLeod	0.1-100,000		*Co Re RR* **Sy** .
Viscosity or molecular	Strictly lab. types	0.0001-100		**In Sd Sy**
	Field (milit. research)	1-760,000		Co *Os* Re RR Ru Va
	Industrial	10-760,000		In *RR* Ru Sy *Va*
Radiometer	Knudsen	0.0001-1		**In** *Sd* **Sy**
	Aluminum vane	0.00001-1		**In** *Sd* **Sy**
	Aluminum leaf	0.1-100		**In** *Sd* **Sy**
Conductivity	Thermocouple	1-500		Re RR *Va*
	Resistance (Pirani)	1-250		Re RR *Va*
	do. semiconductor	1-1000		Re RR *Va*
	Wire length	0.01-100		*Co Va*
Ionization	Thermionic	0.00001-10		Re RR *Va*
	do., fluores. indic.	5-2000		**In Va**
	Cold (Philips)	0.01-1000		Re RR Ru *Va*
	do., glow indic.	0.1-1000		**In Va** Ru
	Alpha-particle	1-10,000		*Re RR Va*
Elastic-member	Unloaded	10-10,000		*Co Va Di*

*Not scale range but LIMITS between which the type is preferably employed.

†Average accuracy of MOST commercial models. Some types are available in high-precision grades.

Bold-face type signifies that remark applies to **ALL** instruments of this type.

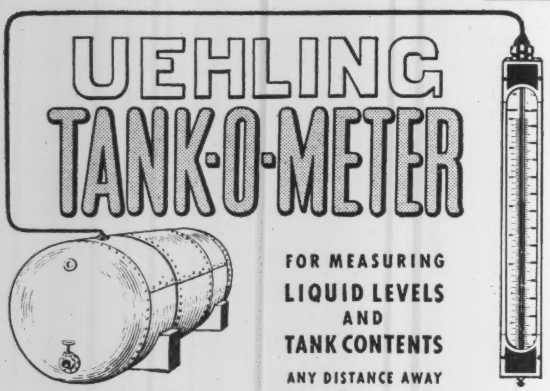
Italics signify that remark applies only to *SOME* instruments of this type.

Symbols in plain roman type apply to majority of instruments.

Abs	Suitable for measurement of absolute pressure.
Ga	Preferably used for measurement of gage pressure (above atmospheric).
OV	Suitable for measuring ordinary vacuum (negative pressure below atmospheric).
Dr	ditto, especially for draft.
Di	Suitable for measuring differential head, as in flow measurement.
Co	Contact arrangements or other on-off pickups available for signaling, etc.
In	Indicating only—No recorders on market.
Os	Can actuate oscillograph for study of extremely rapid fluctuations.
Re	Recording models available.
RR	Remote-reading systems commercially available.
Ru	Rugged construction of primary pressure-sensitive element.
Sd	Suitable for use as Plant Standards.
Sy	For steady pressures only (opposite of Os.).
Va	Suitable for exact measurement of moderately variable and fluctuating pressures.
Vb	Withstand severe vibrations.

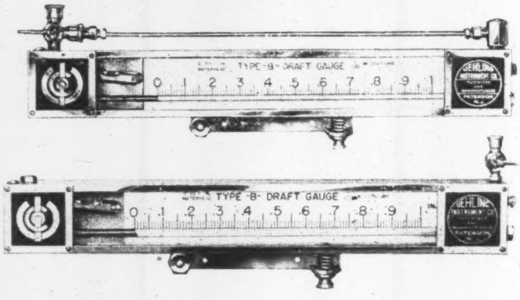
UEHLING INSTRUMENT COMPANY

473 Getty Avenue, Paterson 3, New Jersey
Recording, Indicating and Control Apparatus



TANK-O-METERS may be applied to the measurement of ACIDS, ALKALIS, WATER, OIL, GASOLINE, ALCOHOL, BEVERAGES, TAR, MOLASSES, MILK, PAINTS, VARNISHES, SODIUM SILICATE, SOLVENTS, OR ANY OTHER CHEMICAL SOLUTION. *Send for Bulletin No.* 945.

INCLINED DRAFT GAUGES
For Plus or Minus Pressure
For Differential Pressure



The Uehling Draft Gauges are available with scales from 10" to 40" and waterheads ranging from 1" to 8". Scales are graduated for every 1/100" of waterhead. Each instrument is housed in a durable aluminum case with glass front and adjustable scale. They are extremely accurate as each instrument is individually calibrated. Furnished for draft, pressure, or differential pressure. *Send for Bulletin* 1146.

U-TUBES (STRAIGHT TUBE TYPE)

Uehling U-Tube Pressure and Vacuum Gauges consist of straight Pyrex tubes with a bottom metal connecting base, housed in aluminum case with glass front.

Each instrument has an external micrometer scale adjustment, zero check cock, and drain valve.

Scale lengths from 10" to 100".

Four indicating fluids.

Special calibration on request.

Send for Bulletin 828.

TEL-FLO METER

TEL-FLO METER
MODEL A
UEHLING INSTRUMENT COMPANY
PATERSON N.J.

For measuring flow rates and purging line. Are accurate, exceptionally durable, and attractive. Housed in aluminum case with plastic front to protect graduated glass tube. Can be furnished in aluminum, brass, or stainless steel bodies (or any other metal). Suitable for maximum pressures of 300 lbs. Higher pressures upon request. Furnished with or without control valve and with either top, side, or back connection.

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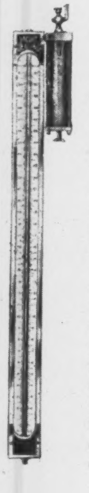
SPECIAL TANK-O-METERS

For fuming liquids, such as hydrochloric acid, nitric acid, propane, butane, ammonia, ethyl chloride, etc.

PRESSURE AND VACUUM GAUGES



Meet the most exacting requirements and combine accuracy, reliability, simplicity and durability. Housed in durable Aluminum cases with glass fronts. Standard instrument covers a range of 31 inches of mercury head. A catch-all for trapping visibly shows any condensate in the connecting line. Each scale has a knurled micrometer screw adjustment. A simple means is provided for cleaning the Pyrex manometer. May be calibrated in any desired units for pressure or vacuum and may be provided with a plus or minus scale to read either vacuum or pressure on the same instrument. Length to suit any range. Greater flexibility is made possible by choice of either mercury or one of three other indicating fluids.

Send for Bulletin 147.

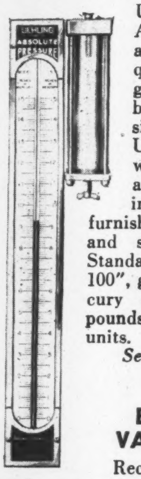
MERCURIAL BAROMETERS

The Uehling Mercurial Barometer is furnished with a scale range of 20" to 31" of mercury graduated for every 1/10", with external vernier scale adjustment which provides readings of .01 of an inch of mercury throughout the range of 20" to 31" of mercury, or with a scale range of 500 to 780 millimeters of mercury graduated for every 1 millimeter with external vernier scale adjustment, which provides readings of .1 millimeters of mercury.

It can be furnished for flush mounting or surface mounting with or without oak panel board.

Send for Print 1155.

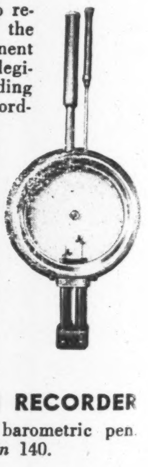
MERCURY COLUMN ABSOLUTE PRESSURE INDICATORS



Uehling Mercury Column Absolute Pressure Gauges are designed for exacting requirements of modern engineering practice, and combine accuracy, reliability, simplicity, and durability. Used with all processes where extremely accurate absolute pressure determinations are essential. Can furnish catch-all for trapping and showing any condensate. Standard scale lengths of 7" to 100", graduated in 1/10" of mercury absolute pressure or in pounds or in equivalent metric units.

Send for Bulletin 247.

COMBINED BAROMETER AND VACUUM RECORDER

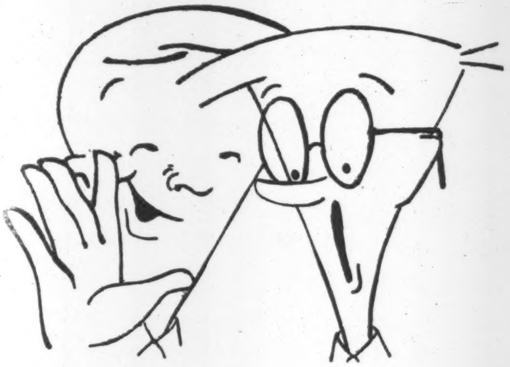


Records barometric pressure and vacuum on same chart. Distance between the two recorded lines represents the absolute pressure. Permanent accuracy and remarkable legibility are the outstanding characteristics of this recorder. Accuracy is obtained by the employment of the mercury column principle and consequently this recorder has the same high degree of accuracy as the mercury column indicator. It employs no springs, diaphragms, or multiplying levers, therefore holds its calibration permanently without readjustment.
Send for Bulletin 150.

UEHLING VACUUM RECORDER

Same as above, without barometric pen.
Send for Bulletin 140.

For more information circle **439** on inquiry card.



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8	28	48	68	88	108	128	148	168	188	208	228	248	268	288	308	328	348	368	388	408	428	
9	29	49	69	89	109	129	149	169	189	209	229	249	269	289	309	329	349	369	389	409	429	
10	30	50	70	90	110	130	150	170	190	210	230	250	270	290	310	330	350	370	390	410	430	
11	31	51	71	91	111	131	151	171	191	211	231	251	271	291	311	331	351	371	391	411	431	
12	32	52	72	92	112	132	152	172	192	212	232	252	272	292	312	332	352	372	392	412	432	
13	33	53	73	93	113	133	153	173	193	213	233	253	273	293	313	333	353	373	393	413	433	
14	34	54	74	94	114	134	154	174	194	214	234	254	274	294	314	334	354	374	394	414	434	
15	35	55	75	95	115	135	155	175	195	215	235	255	275	295	315	335	355	375	395	415	435	
16	36	56	76	96	116	136	156	176	196	216	236	256	276	296	316	336	356	376	396	416	436	
17	37	57	77	97	117	137	157	177	197	217	237	257	277	297	317	337	357	377	397	417	437	
18	38	58	78	98	118	138	158	178	198	218	238	258	278	298	318	338	358	378	398	418	438	
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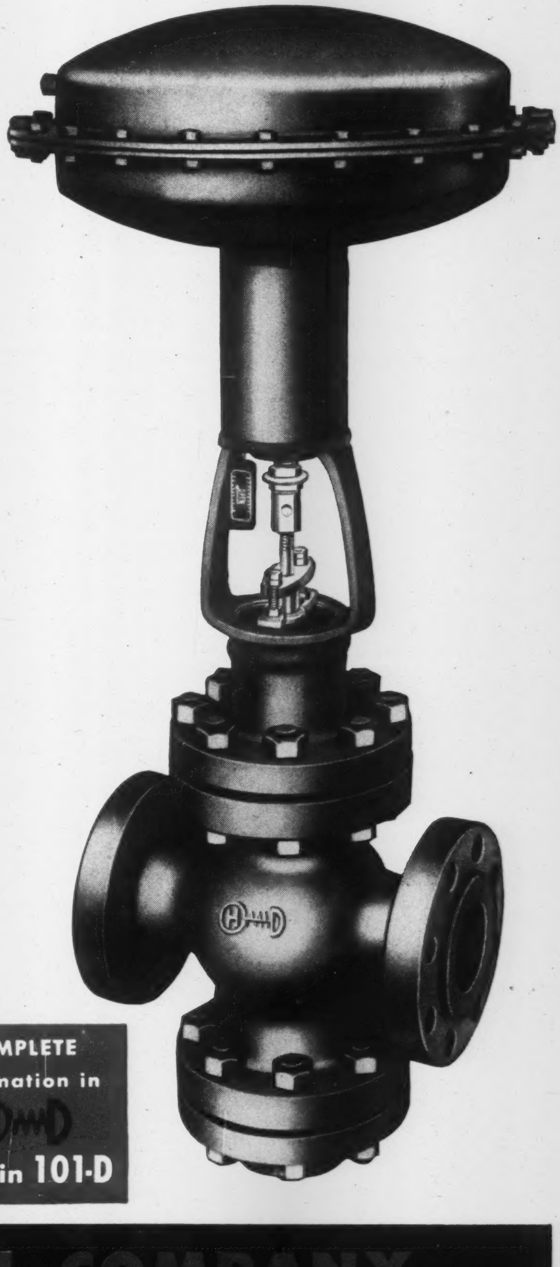

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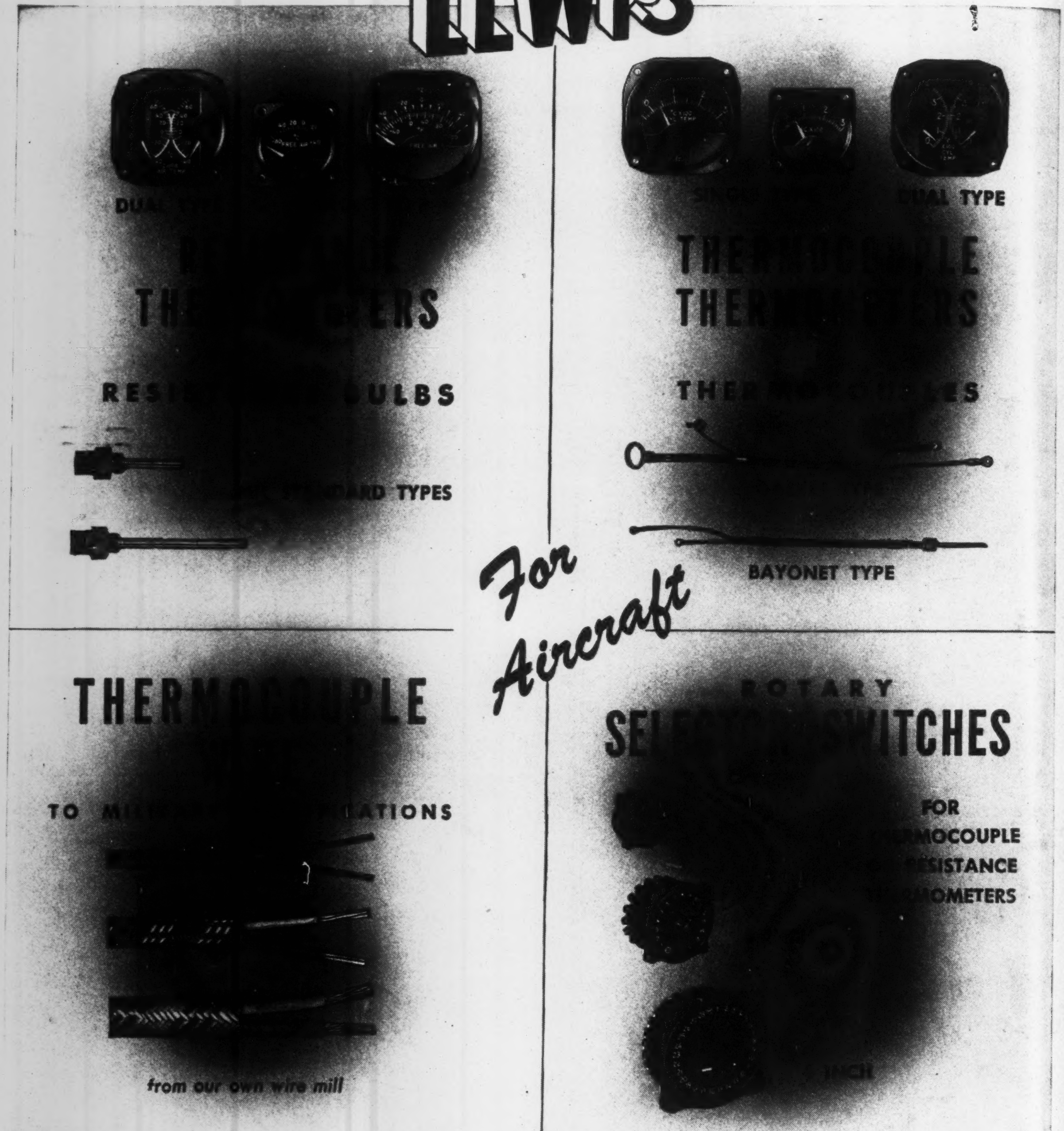
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